RAILROAD GAZETTE

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Contributions.

New York Railroad Statistics.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Cannot you do something to stir up the New York Railroad Commissioners toward making their reports correct? I have had occasion lately to look up some statistics of elevated railroads. The first thing I came across in looking up the Brooklyn Elevated was on page 783 of their report for 1896 (Vol. 2), where they give the total length of tracks, sidings and turnouts as 34.72 miles, adding the length authorized to the length laid, and even then not adding it up correctly. Then, on page 780, although the mileage of road owned is stated as 16.91, the cost of road per mile will not be found by dividing the grand total of 26 millions just above by 16.91.

These errors are sufficient to my mind to stamp all the statistics in the report as unreliable. I think it is too bad that they should occur in the report of any state board. I presume the board has no accountant, and that these figures are printed exactly as they are sent in by the companies; and that the companies, knowing that no supervision is exercised, take no great pains to make the returns correct. ENGINEER.

[The cost per mile as given in the report cannot be deduced from any set of figures found there. The nearest approximation is got by dividing the total cost of road and equipment by the total line - authorized as well as built. But the cost of equipment is given as $71,828, which includes $2,004 for locomotives and $69,355 for cars. The locomotives owned, however, are given as 76, the average cost of each being from $3,249 to $5,250 (a pretty good range for an average) and the cars are 227, and cost ("average") $2,950 and $3,333 each. In short, this report is pretentious humbug.—EDITOR RAILROAD GAZETTE.]

The Kansas Populists and the Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The Governor of Kansas and his Board of Railroad Commissioners seem determined to do what they can to stem the tide of prosperity which, after many years of waiting, the people of that state are at last sanguine is rapidly approaching. The Commission insists upon the request (?) that the roads accept its order reducing the distance schedule freight tariff 20 per cent; coal rates 20 per cent. and live stock rates 5 per cent.; and the Governor calmly threatens the roads with a special session of the legislature and a maximum-rate law unless they submit. At the recent conference between the representatives of the roads and the Commission, the latter announced that there was no need of argument on the question as to whether rates were too high; the Board had reached the conclusion that rates were too high, and the only question open to debate was how much reduction should be made. The railroad men could, of course, do nothing but leave the conference in disgust. Yet this is but one instance from many of the reckless disregard for property rights exhibited by the horde of cranks who are in control in that unfortunate state.

The pity of the whole business is that foreign capital is unable to withdraw from the state entirely and leave it to its own destruction until such time as accumulated calamities shall have either killed off the cranks or humbled them sufficiently so they will at least admit that other people have the right to express their opinions and have them considered fairly. And yet there are many law-abiding, progressive citizens in Kansas who are constrained to sit idly by and can only exclaim, "How long, oh Lord, how long?" A representative of the latter class once said to the writer: "Don't go back East and say everybody is dishonest. There are a good many of us here who are trying to redeem the reputation of the state, but I sometimes think that unless the good Lord stops the cranks coming in we shall all die before we succeed." P.

Cast Steel in Construction.

ALBANY, June 14, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article on "The Use of Cast Steel in Locomotive Building," in your issue of June 11, will again call the attention of your readers to an available product which does not yet seem to be widely known, and certainly is not generally appreciated, namely the steel casting. As the mention of a steel bridge or a steel boiler conveys the idea to the majority of laymen of a metal like that in their pocket knives, rather than of one which, while stronger, is even more ductile and malleable than iron so the term steel casting is not infrequently connected in many minds with brittleness.

The misconception is not alone due to crediting the brittle properties of the iron casting to those of steel, but to lingering recollections which most of us have of the general worthlessness and unreliability of certain tools that we have seen stamped "cast steel."

"Cast steel" is a term that was introduced to distinguish crucible steel from "blister steel" or "weld steel" at the time crucible steel came into use, and once indicated the highest quality. To-day the term means nothing definite, for Bessemer and open-hearth steels, both basic and acid, are all "cast steels." The term "cast steel" might by this time have passed into history, were it not due to the practice of many manufacturers of hardware of *truthfully* stamping the words on inferior articles, and allowing the unsuspecting public to infer that it is the same metal that their great grandfathers thought so highly of.

While the "cast steel" of to-day is very likely to be a brittle and worthless material, a good steel casting is quite the opposite. Good steel castings are not only strong but tough, and have ductility and malleability not much inferior to rolled structural steel. A round rod turned from a steel casting may be tied in a knot, cold, and after cutting the felloe of a wheel between the spokes, the latter may be twisted up or bent over on the hub without a break. Moreover, steel castings may be forged hot or straightened cold.

It is safe to say that any machine or structural casting that can be made in iron can also be as well or better made in a steel casting, and with the result that instead of having a weak and brittle object, we have one that is tough, ductile and of any degree of strength that may have been decided on beforehand. Steel castings may be safely and economically used in tension as well as compression, which iron castings cannot.

Having discovered the general value, utility and economy of steel castings for important work, it will not do to simply order or specify a "steel casting," or we may find that we had better have stuck to iron castings. There have been many so called steel castings that it would bother any metallurgist to classify with any known or recognized product, beyond the fact that they contained nearly 100 per cent. of iron; they have lacked many elements that they should have had, and contained to excess many that they should have lacked. To obtain a good steel casting we must have a good specification, and for ordinary and general purposes the following will give good results:

Specification for Steel Castings.

Steel castings shall be made of acid open-hearth steel containing not more than .08 of 1 per cent. of phosphorus nor more than .05 of 1 per cent. of sulphur.

They shall be carefully and uniformly annealed, and test pieces cut from annealed castings shall have a maximum tensile strength of not less than 60,000 lbs. per square inch and an elongation after fracture of not less than 20 per cent. on an original length of 2 in. Castings shall be true to drawings, smooth, clean and free from blowholes, sponginess and other defects.

For important or special work a more elaborate specification should be made, in which the strength may be increased to 90,000 lbs. if desirable, the phosphorus and sulphur lowered, and account taken of manganese and silicon, which are important but not dangerous elements in steel castings.

It is the general American, but not European, practice to specify elastic limits for structural materials. If this is done for steel castings the minimum should be placed at 45 per cent. of the maximum strength, as owing to lack of work by rolling or forging it will often fall to this point.

Acid open-hearth steel has been specified as it is according to the best practice of the largest steel founders, and for very good reasons. It requires the best of melting stock, and its composition can be accurately calculated beforehand. When the steel is made it can be held in the furnace for a reasonable length of time without change or deterioration, while molds are being placed or changed, which is not the case with basic steel.

Welds on steel castings, or, in fact, in any form of Bessemer or open-hearth steel, should be carefully avoided as they are very unreliable and uncertain.

The original "blister steel" welded readily, as it retained the cinder of the wrought-iron from which it was made, but Bessemer and open-hearth steel contain no cinder to form a natural flux, and heated surfaces oxidize at once on exposure to the air.

The foregoing is doubtless familiar to many of your readers, and of such we crave their forebearance for the benefit of the others who do not yet "know it all."

A. C. CUNNINGHAM, *M. Am. Soc. C. E.*

Railroad Telegraph Superintendents' Convention.

The Association of Railway Telegraph Superintendents held its sixteenth annual convention at Niagara Falls, June 16 and 17. The attendance was rather small, which may be accounted for by the fact that other conventions were being held at other places.

Mr. Charles Selden (B. & O.) was called upon to preside, in the absence of President G. M. Dugan.

Six new members were proposed and elected. The Treasurer's report was then read and placed on file. It showed that the association was in its usual good financial condition.

Owing to the meager attendance of members on Wednesday morning the meeting adjourned until 7:30 p.m., and during the afternoon the members and the ladies went over the Buffalo & Niagara Falls Electric Railway to visit the power-house of the Cataract Construction Company. Through the courtesy of Resident Engineer W. A. Brackenridge and Superintendent Lincoln the party was afforded every facility to witness the practical operation of the unique apparatus in this remarkable plant. The whirling 5,000-H. P. electric generators; the rotary transformer, which starts the 1,000-H. P. railroad current on its way to Buffalo; the static transformer house, where the same current is raised to a pressure of 11,000 volts for its long distance transmission to Buffalo; the huge electric conductors, carrying enormous energy, and the great wheel pit, which is now being extended, all formed objects of deep interest. While in the transformer house Superintendent Lincoln performed an experiment which demonstrated visibly the enormous energy of the 11,000-volt current that is carried to Buffalo overhead. By means of a static transformer the pressure of 11,000 volts was raised to 40,000 and at this latter pressure the insulating qualities of a glass battery jar were put to a test. The intense pressure overcame the resistance thus offered to the path of the current, with the result that the surface of the jar was completely covered with miniature bolts of lightning, darting in every conceivable direction on the surface, and emitting the familiar crackling noise of lightning, only, of course, on a much smaller scale. The heat evolved by the intense activity of the current finally caused a fracture in the glass.

The evening session was called to order at 8:15 by Mr. J. W. Lattig (Lehigh Valley), Vice-President of the Association, and Mr. Charles Selden read a paper on "Railroad Telegrams."

Mr. Selden early decided to promote neatness and methodical habits by providing a uniform blank, and such stationery is now the rule on railroads and not the exception. He then went a step further and made a rigid rule for checking messages, to insure accuracy in transmission and reception. If a telegram quoting a rate of "twenty-one" dollars a car is passed by the transmitting operator sending "twenty" dollars a car, the error is chargeable to the receiving operator for allowing a wrong check to pass through his hands. Each figure or cipher is counted as one word, and each fraction as one word. Ten years' experience has justified this action. In six years Mr. Selden has had but one case of error in rates quoted, due to a short check, while before checks were required they were comparatively frequent.

The B & O. now records the work of the telegraph department, on the principle that it may rightfully charge for its work, not with a view to simply giving it a bookkeeping credit, but to impress upon each officer that telegraphing is not "free," although so-called, and that it costs money just as does transportation or maintenance of way. Two rates are charged, viz., 10 cents for 10 words or less, and 20 cents for anything over 10 words. Instead of frequently receiving a circular calling attention to the misuse of the wires, an officer now receives a bill showing charges against his department. Two months' trial of this plan has been very gratifying. Not only has the volume of business greatly diminished, but the wires are now so cleared that much better service is the result: the interests of the road are not harmed and the pay-roll and wire rental shows a reduction of about $5,000 per annum, and will soon show more.

A paper on "The Telegraph" was read by Mr. Asa R. Swift, of the C., R. I. & P., and was followed by one on "The Apprenticeship System," by Mr. G. C. Kinsman, of the Wabash road. Mr. Kinsman argued in favor of a board of officials to pass upon applications for minor positions, such as messengers and those desiring to study telegraphy, in order to secure persons of good character. The practice on his road, the Wabash, required the applicant to furnish evidences of character; and if the applicant is physically sound and not color blind he may be considered eligible for an apprenticeship. Great care in the selection of employees for minor positions was a matter of great importance, as it meant the difference between high efficiency of service and low efficiency.

After brief discussion of the subject of Mr. Kinsman's paper, Secretary Drew read a paper by Mr. L. H. Korty (Union Pacific) on the subject "Delivery of Commercial Telegrams at Railway Offices."

One of the most important duties at a station, Mr. Korty stated, is the prompt and proper delivery of commercial telegrams. Delays of delivery are far more

frequent than those of transmission, and many railroad operators fail to take receipt for telegrams when delivered. Some agents who would not think of delivering a shipment of scrap iron, an old horse collar, or any old thing, without taking an iron-clad receipt, will deliver commercial telegrams involving thousands of dollars, without making any kind of a record of the transaction. Telegrams addressed to passengers on trains must necessarily be given to the train conductor. The conductor turns it over to the brakeman and he may fail to make a thorough search of the train, puts the message in his pocket and the matter is forgotten until receipt of claim for damages for non-delivery. Mr. Korty had recently introduced a simple method of checking for the purpose of securing proper receipts for telegrams delivered, and any failure to obtain receipts can be discovered. The General Manager issued a circular requiring conductors to give receipts for commercial telegrams for delivery on train; to make due effort to find the persons addressed and take receipts for the same, giving time of delivery, and in case of failure to find the person, to report the fact to the receiving office from the next stop. Blank forms are supplied to conductors for this service. The circular, Mr. Korty stated, was issued two and a half years ago, and in that time there has not been a single failure of a commercial message reaching a passenger on the Union Pacific.

The announcement was made that through the courtesy of Mr. E. J. Hall, General Manager of the Long Distance Telephone Company, the free use of that company's wires during certain specified evening hours was extended to the members; also like courtesies by Superintendent Gifford, of the Western Union Telegraph Company.

The meeting then, at 10:30 o'clock, adjourned until Thursday morning.

At Thursday morning's session, which began at 9:30 o'clock, the Secretary read letters of regret from Mr. T. A. Edison and others. Several honorary members were elected.

The committee appointed at the last convention to conduct the low resistance relay experiments made its report through Mr. W. W. Ryder (C., B. & Q.). At last year's convention Mr. U. J. Fry (C., M. & St. P.) gave an account of some experiments he had made on his company's telegraph lines in the use of relays of low resistance (25 ohms.) in place of the standard instruments (150 ohms each), and stated that the results were remarkable. With the low resistance instruments on wires that previously had had to be abandoned temporarily in stormy and wet weather there was now very little difficulty experienced, thus apparently indicating positive advantage in the use of the low resistance instrument. It was to investigate the subject further that this committee was appointed. The results of the committee's experiments during the year have been so conclusive as to leave no room for doubt. Two lines of experiments were conducted, viz.: the splitting of the coils of standard relays—that is, connecting the two magnets in parallel—and the use of low resistance, series wound, "pony" relays. The scheme of splitting the coils was tried on 51 circuits under the varying conditions of five railroads, and the results showed a decided improvement in service, especially in bad weather. The most marked improvement was obtained, however, with the use of a 25-ohm series wound relay. Lines equipped with these instruments work equally well in good or bad weather, as shown by the tests, and in every case the low-resistance instrument worked much more satisfactorily than the one it replaced. Another important consideration in this connection is the fact that the battery power can be reduced in the same ratio as the instrument resistance, thus effecting a corresponding saving in battery material and maintenance costs. Telegraph engineers have always based their calculations on the old law that the combined resistance of the instruments on a wire should equal the resistance of the wire itself plus that of the battery. The committee's opinion is that this law never applied to telegraph circuits.

The committee appointed to report upon the deaths during the year of ex-President M. B. Leonard, and Messrs. R. B. Gemmell and J. G. Pinkerton, then made its report in the form of the customary resolutions, which were appropriately acted upon.

The Secretary suggested the advisability of devising ways of increasing the revenue, and on motion of Mr Selden a committee of three was appointed to consider the question of initiation fees and dues. The chair subsequently appointed Messrs. Selden, Swift and Fry as that committee

An interesting paper on "The Relay and its Relation to the Telegraphic Circuit" was then read by Mr. Thos. D. Lockwood, of Boston, an honorary member of the association. This paper was largely a discussion of the elementary principles of telegraph relay construction and was very complete in this respect. Its purpose was to explain why the low resistance relays (experimented upon by the committee already referred to) apparently gave better results in actual service than the standard, 150 ohm instrument. It corroborated the statements and opinions of the committee. His conclusions were—Ampere-turns are what must be relied upon to secure magnetizing power, and a liberal allowance of ampere-turns must be made to obtain good results; it is bad practice to connect up a great number of relays in a single circuit; it is bad practice to attempt to relieve such a circuit by connecting with it relays of low resistance, made so by a series winding of coarser wire; the standard 150-ohm relay is a good average instrument for an average circuit and is based on experiments embracing a number of average conditions; it is extremely bad practice to have high resistance and low resistance relays in the same circuit: whatever the resistance of the relays employed, all should be uniform; if a plurality of lines are worked from the same battery, all should be of substantially the same resistance, and, finally, the so-called law specifying the relative proportions of line and relay resistance has little force under practical conditions.

A general discussion followed. The remarks consisted chiefly of testimony of the beneficial results of using low resistance relays. The importance of the subject was such as to warrant the continuation of the committee for the purpose of conducting futher experiments.

The chair then appointed the following committees: On Arrangements, Messrs. W. W. Ryder, H. C. Hope and C. P. Adams; on Topics, Messrs. Kinsman, Rhoads and Brill; after which the convention, at 1 p m., adjourned.

The members spent the afternoon in trips down the Gorge road and the Niagara Falls Park & River Railway, and visiting other places of interest.

The election of officers for the ensuing year resulted as follows: President, J. W. Lattig (Lehigh Valley); Vice-President, W. W. Ryder (C., B. & Q.); Secretary and Treasurer, P. W. Drew (Wisconsin Central). When the question of the next place of meeting was brought up. Mr. W. W. Ryder extended an invitation from the Burlington road to hold the next meeting at Hot Springs, South Dakota, and it was unanimously decided to meet there June 15, 1898.

EXHIBITS.

The Parrish Signal Co., Jackson, Mich., exhibited one of its electric highway crossing signals, applicable to single or double track. In the complete operation of the bell there are only two mechanical movements, and the simplicity of the mechanism is its chief feature. Diagrams showing the electrical connections of the bell were displayed.

J. D. Taylor & Co., Chillicothe, O., manufacturers of the Taylor Highway Crossing Signal, for single or double track, showed a sample of the controlling relay. The claims made for this signal are: fewer electric circuits, fewer contacts, simplicity and reliability.

The "S. & R." crossing warning signal was exhibited by Mr. Charles Selden, General Agent, Baltimore. In this signal the bell rings until the entire train passes the crossing, on either single or double track.

Mr. Clark, of the National Self-Winding Clock Co., Elgin, Ill., showed the mechanism of these clocks, which are both self-winding and self-synchronizing, and explained their operation. The mechanism has been greatly simplified since last exhibited before the Railway Telegraph Superintendents.

Messrs. J. H. Bunnell & Co., New York, exhibited samples of an electric gong, and various telegraph instruments.

Mr. W. S. Eckert represented the interests of the Bi-Metallic Electric Transmission Co., New York, and carried in his pockets samples of bi-metallic wire. This wire is of copper exterior with a steel core, the two metals being so united as to be homogeneous at the point of juncture.

The National Association of Car Service Managers.

The eighth annual meeting of the National Association of Car Service Managers was held at Boston, June 16 and 17. There was a good attendance, and the meeting proved as interesting to those present as any of its predecessors. Sessions were held both on Wednesday and Thursday, during which many questions of the details of car service were discussed. The members regard these annual meetings as highly valuable in affording an opportunity to interchange views on matters of general interest.

The President, Mr. A. P. Wilder, of Topeka, Kan., presided. Reports were made by the standing reference committee, and by several special committees on subjects assigned them at the last meeting, which were received and adopted.

Papers were read as follows: "The Car Service Regulations of the Railroad Commission of Georgia," J. C. Haskell; "The Car Service Dollar; Legitimate Railroad Earnings," W. M. Prall; "The Progress of Car Service," A. J. Elliott; "Car Service Revenue," A. L. Gardner.

Mr. Haskell's and Mr. Gardner's papers were reported in the *Railroad Gazette* last week, page 432.

Mr. Elliott (Peoria) presented a short paper contrasting the past with the future. He read copies of letters, now framed in his office, in which, back in 1889, he requested consignees to tell him when they would unload certain cars which had been waiting 20, 30, 40 and even 56 days. Some consignees had as many as 6, 8 or 10 cars. The answers were: "Will try and get them unloaded and return promptly"; "Next week"; "The state that trade is in, it is impossible to say when the above cars can be unloaded"; "Will be emptied some time." This was the effect of what might be termed a "moral suasion bureau." The dollar-a-day has proved a much more effectual persuader and to-day great progress is evident in spite of the secret and sometimes the open opposition of the traffic and other departments.

Mr. Elliott went on to urge car service managers to fully inform themselves concerning every phase of the business under their charge. A manager should acquaint himself with legal conditions affecting car service and in litigation see that the lawyers do efficient work. He held also that some red-tape in clerical work might safely be dispensed with. It is unnecessary to have agents report cars on arrival, then again when disposition is given, again when placed for unloading and a fourth time when the car is released. Possibly a few extra dollars may be gained by closely checking the consignees' unloading, but generally the extra labor is not worth while. Again, why record all cars or even have them all reported to the manager? Cannot agents be allowed to omit many, without detriment?

Mr. Prall (of St. Louis) read a paper emphasizing the importance of having it well understood that the manager, in dealing with consignees, always acts for the individual road. The manager when acting as a claim agent should receive the same consideration as a freight claim agent.

The convention adopted the following resolutions, embodying the recommendations of Mr. Gardner's paper:

. . . Whereas, Experience has shown that where agents are held to a strict accountability for all car-service earnings, and the collection is properly followed up by the accounting department, bills are collected more promptly, and a great deal of this revenue saved, which is lost to the railroad companies where agents are only required to account for moneys collected; therefore, be it

Resolved, that it is the sense of this association that agents should be held responsible to the accounting department for every dollar of earnings, the same as for freight charges; that they should be required to make daily manifests, charging themselves with all car service earnings as they accrue; and that they should make collection promptly when the goods are delivered. And:

Whereas, the car service earnings are a separate and distinct terminal revenue for the use of car and track, entirely disconnected with charges for carriage, and inasmuch as the car service earnings are compared with the expenses of operating car service associations, they, in our judgment, are justly entitled to a fair proportion of all revenue arising from their operation; therefore, be it

Resolved, that it is the sense of this Association that whenever consignments are disposed of (either by sale or otherwise) for less than the full amount of freight and car service charges, the amount realized should not be applied in full to the freight charges, but should be prorated equitably between the two accounts.

Officers for the ensuing year were elected as follows: President, A. L. Gardner, Baltimore, Md.; Vice-President, R. A. Taylor, Richmond, Va.; Secretary and Treasurer, A. G. Thomason, Scranton, Pa. The place fixed upon for the next annual meeting is Columbus, O.

Steam and Trolley in the Connecticut Legislature.

BY CLARENCE DEMING.

In the trite but apt metaphor of warfare a third campaign of steam against the trolley in Connecticut ends with the close of the session of the legislature just adjourned. The first of these epochs of conflict opened with the legislative session of 1893. It was marked by a combination of trolley promoters with a granger element, liberal grants of special charters and the passage of a general street railroad law not so restrictive on these enterprises as the steam corporations wished—this result being due to the slow awakening of the steam companies to the gravity of the new competition. In the second legislative epoch, that of 1895, the opening of the session found the steam interests fully aroused. With a highly organized lobby they dominated legislation, defeated electric charters without number, secured the passage of a measure prohibiting grade crossings of steam and street railroads, and obtained from the railroad committee a ruling that during the session electric companies owning their roadbed must come in, if at all, under the severe restrictions of the old general steam railroad law.

The profuse granting of charters by the legislature of 1893 was followed, naturally, by a great expansion of new trolley roads, many of them speculatively financed. During the period of two and a half years, beginning with January, 1893, the mileage of street railroads in the state increased about 100 per cent. This was checked somewhat abruptly by the legislative session of 1895 when so many trolley schemes went to wreck. But some of them remained alive, though sleeping, and with other schemes were massed for the legislative session which has just closed, and the situation was intensified by the fact that obstructive tactics in the courts and in the legislature of the New York, New Haven & Hartford had prevented street-road connections between any two Connecticut cities Two added facts gave last autumn a certain dramatic interest to the new legislature then about to meet. One was the credible report that in the election of legislators and especially of the 24 members of the upper house the trolley influence had been exerted with results. A second fact was a semi-official announcement of the Consolidated Company, which had scaled down remorselessly the lobby charges after the session of 1895, that in the approaching session it would dispense with its lobby, rely on moral and argumentative forces and conduct the legislative campaign on ethical lines. Thus an issue was raised at the outset not merely with the trolley seekers but with a body of legislative toilers in the "third house," angered by memories of losses incurred and fears of potential losses to come.

The story of this unique "moral campaign" of the steam railroad corporation in a Connecticut legislature is transitory, and may be traced at this point to its satirical conclusion. It opened with a bombardment of the lobby and its works by many of the newspapers. They declaimed loudly against abuses in the "third house"—an institution, by the way, which owed its existence and abnormal development to its new assailant, the steam railroad corporation, more than to any other promoting cause. With men and journals usually recognized as subordinate to the Consolidated road were joined in the attack other men and journals of a higher type prompted by the hope that the pernicious lobby might be weakened, if not killed, by the opposition of its old patron. Into the inner and more subtle details of this brief "moral campaign" to "beat out" the lobby one cannot enter, but phenomena and results can be described. It is certain that, by common report, the trolleys and the lobby first won a victory. Test votes indicated pretty clearly that the Railroad Committee and the Senate

were against the steam railroad interests, but by small and what were described at the time as "convertible" majorities. It is certain, also, that a little later the anti-lobby cry on the part of the steam railroad corporation was suddenly stilled, that old lobby workers in the steam interests reappeared, and that there was a visible change in the attitude of the Senate and of the Railroad Committee. If the "moral campaign" continued it was well disguised, and was certainly not loudly proclaimed by anybody.

After the moral campaign had ended, the contestants were seen more clearly to be divided into three groups. These were, first, the steam railroad corporations—which, for all essential purposes, in Connecticut, may be classed as the Consolidated Company—resisting street railroads as parallels, but friendly to them as laterals. There was, secondly, the "old" and operating electric companies, which, under the general street railroad law of the state, are protected against parallels as much as steam roads. Many of these were seeking extensions paralleling steam roads, and in that relation antagonized the Consolidated; but, if not seeking parallel extensions, they were in friendly alliance with it. Finally, there were the new and independent electric enterprises, which, according as they involved parallels or not, were opposed or favored by the Consolidated Company. It will be seen that the trolley interests were not united; and, indeed, before the session ended, "divide and conquer" became a successful maxim of the Consolidated Company's workers.

The main battle for some time raged hotly over what became famous as "Section Eight" of the general street railroad law of 1893. The trolley forces made at first an effort to repeal this section, which sends parallel schemes to the courts on the question of public necessity and convenience and which, as interpreted in several judicial decisions, had proved very obstructive to projected parallels in the state. The attempt to repeal was presently abandoned and then the contest turned on the question of reporting charters or charter amendments, without the judicial restriction of the section named. Here the Consolidated Company won in the Railroad Committee a qualified but important victory. The committee voted to report all charters subject to the judicial clause, but the Consolidated Company, as the price of its success, was forced to promise to drop opposition in the courts to several projected parallels, notably the long-fought Hartford and New Britain parallel and the new Torrington and Winchester project. It may have been a mere coincidence that the latter enterprise was strongly supported, as an investor and promoter, by the Chairman of the Republican State Central Committee, who later in the session was appointed a State Railroad Commissioner. Two or three other parallels, only one of them of much importance, went through the committee and the legislature subject to later judicial ruling under Section Eight.

Two schemes very dangerous to its interests the Consolidated Company by securing unfavorable committee reports defeated outright. One involved a "cut-off" street line between New Haven and Seymour. The second was a project threatening a deadly parallel between New Haven and Derby, which, if constructed, would have swept away the large steam railroad traffic between New Haven and two cities of the lower Naugatuck Valley.

The contest over the Montville project aiming at a parallel between Norwich and New London is a dramatic story by itself. It was by far the most sharply fought of any single trolley enterprise. The project had been thrown out of court on a technical error in organization and the company had come to the legislature to heal its charter. The Senate first rejected an unfavorable committee report, but finally rejected the enterprise in several successive votes after the Lower House had strongly approved it, and had asked for a Conference Committee. The project seemed dead, and its defeat excited much popular anger in the two interested cities. But a clause which has slipped through the Senate unnoticed shrewdly concealed in a general healing act, and giving corporations of the kind power until next October to correct flaws of organization and transfers, has apparently flanked and defeated the Consolidated Company. The Senate, on discovering the slip, made desperate efforts to recall the bill, but the Lower House refused. This happened three days before the end of the session, and a touch of humor is added to the incident by the fact that the leading Consolidated workers had stayed at home, deeming all railroad legislation ended. Besides the Norwich and New London line the healing act may validate other electric lines under old sleeping charters.

Summarizing the results of the legislative campaign, the steam companies, while not victorious along the whole line, have emerged more successful than might have been expected in a long defensive contest. On the first of last January there were approximately 350 single-track miles of electric road in the state, and about 71 miles of steam railroad was paralleled. Somewhat roughly estimated, the outgoing legislature has chartered new electric roads or extensions representing about 168 miles. Of these 56 miles, if built, may seriously affect steam passenger traffic, assuming one of the lines to be the Montville; but companies representing at least 26 miles of parallels injurious to steam roads must run the gauntlet of the courts on the "necessity and convenience" clause, with uncertain prospects. The total number of miles in parallel roads authorized is about 92, of which 15 miles are very unlikely to be constructed, owing to the poor outlook for patronage, and for the same reason about 45 miles, parallels and non-parallels, out of the total of about 168 authorized, may never materialize. The non-parallels authorized and likely to be built comprise about 31 miles, and of roads classed as parallels technically some are so indirect as to be obstacles to more direct and dangerous competition rather than competitors themselves—this being in two or three cases a shrewd device of the Consolidated Company to block off future rivalry. Twelve new roads have been incorporated and about 30 amendments to old charters have been granted. Almost all the new roads and extensions authorized are "cross-country" lines, showing that the limit of street railroad building within cities of the state has been almost reached for the present.

As regards the grave menace of inter-urban competition the Consolidated Company has conceded it between Hartford and New Britain and met it by the third rail. Between Bridgeport and Norwalk, Bridgeport and the two cities of the lower Naugatuck Valley—Derby and Ansonia—and between Norwich and New London, the great corporation may have to encounter the new rivalry, the question resting with the courts; elsewhere at all important urban points the Consolidated has succeeded in blocking electric competition for two years at least.

There has been during the session no general legislation worth mentioning. The expected contest ensued between the cities and the larger towns, on the one hand, and the country towns, on the other, the former urging local taxation of street railroads in place of the present state tax. A measure of the sort passed the Senate, where the larger municipalities are pretty strongly represented, but was overwhelmingly rejected in the Lower House, where the passage of the bill would have meant additional taxation for state purposes on the rural towns. General and constructive legislation failed, partly through the antagonism of the two houses, but chiefly because the steam interests, being pretty well protected already by existing laws, were unwilling to take the risk in a defensive contest of fathering positive measures almost predestined to defeat. To this cause, perhaps, may also be assigned the continuance of the paradox in the state of placing new steam roads in one category of restraint new electric lines in another. The former—except as to new branch lines—are subject to no judicial restrictions as to convenience and necessity, but to very severe restrictions to guarantee financial solidity and good faith; while electric ventures, if parallels, must be approved by the courts, and, whether parallels or not, are subject to no statutory financial restrictions whatever. With so many of these companies in Connecticut very dropsical, and more of them likely to be so, it seems strange that the idea of allowing them, if owning their roadway, to build freely like the steam companies under financial safeguards and checks, and relieving them from the judicial test, was not pressed as offering the most rational solution of the problem. Yet during the long and rancorous committee hearings on "Section Eight" the plan, as a substitute, does not appear to have been even suggested.

Railroad Legislation in Massachusetts.

The session of the Massachusetts Legislature, just closed, was prolific in railroad legislation, though, as always, more suggested legislation was killed than was enacted. The committee on railroads had 33 matters referred to it, upon which it gave 44 hearings. For the first time the street railway committee was a large one, four senators and 11 representatives. This committee had 61 matters referred to it, and gave 113 hearings. Fifteen of these were given in conjunction with the committee on metropolitan affairs, on the petition of the Boston Elevated Railway Company for a revision of its charter. With the possible exception of the bill to provide for an expenditure of $400,000 for a great public dock at the South Boston flats, near the present docks of the New England road, with its companion bill to expend $100,000 for the purchase of land for a dock in East Boston off the deepest water in the harbor, there was no other legislation passed this year so important as this elevated bill.

In 1895 the legislature enacted the "Meigs" bill, providing for a network of elevated railroads in and around Boston. The bill would have failed but for the rider which was tacked on, to provide for the subway under the Common and Tremont street, which is now partly completed and will be occupied by the West End cars in July. This law of 1895 prohibited the use of the "Manhattan system," and when the charter was purchased last year by the present owners, Kidder, Peabody & Co., J. Pierpont Morgan and others, it was seen that it would be of no value unless this prohibition were removed, and unless the elevated could in some way use the subway, thus avoiding the extremely unfavorable damage clauses of the act as approved. Not only this, but it was assumed that it would be practically useless to attempt to operate the elevated as a competing road to the West End, which has the monopoly of street surface lines, and that it would be profitless to purchase the West End, unless in some way there could be a guarantee against the unfriendly legislation which has threatened the West End, particularly that requiring free transfers. The West End owned the lease of the subway, which must be had also.

Therefore, on Feb. 11, a petition was put in for such amendments to the charter of the Boston Elevated Railway Company as would permit it to change its locations in certain particulars, to purchase the West End road, and which should grant it immunity from a reduction in rates of fare from five cents for a continuous ride in any one direction, or compulsory increase in free transfer privileges over those of a very generous nature which it specified, for a term of 30 years. In return for these privileges and exemptions it guaranteed a franchise tax and other inducements.

The members of the committee and of the legislature seemed to feel from the beginning that this was Boston's supreme opportunity. After 15 hearings the bill was reported in the house on May 17. It was amended on two stages, reached the Senate June 1, amended on both stages there, and finally passed in a form satisfactory to the petitioners, though the right to purchase the West End had been changed to that of a lease only, and the term of the franchise had been cut down to 25 years.

By the terms of the bill as approved by the Governor, the elevated road can gridiron Boston in almost every direction, excepting that it cannot run over Washington street, in the city proper, and will have to go under Tremont street, in the subway. While it is understood that only seven miles shall be built at first, outside the subway, the locations cover practically all the suburbs. The third section provides that whenever the company makes a request for a subway under Cambridge street to connect with the present subway, coupled with an agreement to lease it for twenty years at the same terms as now paid by the West End for the present subway, it shall forthwith proceed to construct the same, and shall at its own expense widen the street to a width of 30 ft. on each side of the same. The Mayor of Boston is to approve the construction of the elevated road, the company having the right of appeal to the Railroad Commissioners. The construction from Albany to Merrimac street on the water side shall be of such strength as to permit the hauling of standard railroad cars, and the company is given permission to haul such cars, also freight and baggage. The fare shall be five cents, but it can be reduced on petition to the Railroad Commissioners after due notice and hearing, provided the toll or fare shall not be so reduced without the consent of the company so as to reduce the income to less than eight per cent. on the actual cost of construction of all lines owned, leased or operated by it, including damages to property. Section 8 provides that during 25 years no taxes, excises or other burdens not at present in fact imposed on other street railway companies shall be imposed, provided that it shall pay all taxes now or hereafter imposed on street railway companies, and in addition as compensation for the privileges of use and occupation of public highways, pay to the commonwealth on or before Nov. 1 of each year a sum to be determined by the annual dividend. If the dividend is four per cent. or less, the sum paid shall be equal to seven-eighths of one per cent. of gross earnings. If the dividend exceeds six per cent., then a sum equal to the excess paid over six per cent., in addition to the seven-eighths of one per cent. shall be paid. This shall be distributed to cities and towns in proportion to the number of miles of single track operated in each. Free transfers are provided from elevated to surface or *vice versa*, and on the surface lines as required by the Railroad Commissioners. Remaining sections—there are 19 in all—provide for the lease of the West End road if it consents; for proper alterations in the subway to permit the running of elevated cars through it; for a $300,000 forfeit to be deposited with the Treasurer of the commonwealth, to insure the construction of not less than four nor more than seven miles within three years, in case of failure the lease of the West End to cease and determine; for a tunnel large enough for two tracks under Boston Harbor, from Scollay square to Maverick square, in East Boston; and repealing the prohibition of the use of the Manhattan style of structure.

Throughout the weeks of consideration of the elevated bill, a number of bills calling for free transfers on connecting lines of the West End road were pending. The bills were held back by the Street Railway Committee as long as was possible, for it was understood that the granting of unlimited transfers would so curtail the West End's dividends that the Boston Elevated would not care to purchase or lease it. The transfer bills have now been rejected.

The most important steam railroad petition of the year was that of the Hudson River & Berkshire Company, of New York, for leave to build in Massachusetts. The petition came in Jan. 27. A hearing was given by the Railroad Committee on Feb. 16, and closed. It was April 26 before it was reported. At one time a poll of the committee was taken, and it was found to be adverse to any bill. The feeling in the committee was that while it was of importance that the residents of Berkshire County, for a distance of 50 miles, should have the railroad accommodations, it would have been better for the petitioners to ask a Massachusetts charter, as the bill they submitted would not place them under any of the anti-stock watering restrictions of the Massachusetts laws. From the first it was understood that the bill was opposed by the Boston & Albany, and also by the New Haven. It was finally adversely reported, and placed on the table of the House. The petitioners at once asked for a Massachusetts charter, the petition coming in so late that it was necessary to have a three-fifths vote in each branch to admit it. The vote was secured in the House without difficulty, but when it reached the Senate the Fitchburg road took a hand,

and representations were made to friendly Senators that the construction of the road from the New York state line to Westfield or Springfield would deprive the Hoosac Tunnel line of the annual haul of a million tons of coal. The result was that while there was a majority of the Senate in favor of the admission, it was impossible to obtain the requisite four-fifths. This made the House angry, and the bill originally asked was taken from the table and substituted for the adverse report.

This bill permitted the construction of a road from the New York line through Mount Washington, Egremont, Great Barrington, Monterey, Otis, Sandisfield, Tolland, Granville, Blandford, Russell, Southwick, Westfield, Agawam and West Springfield to Springfield. The bill said nothing as to capitalization, but permitted the company to mortgage the road, equipment and franchise to the amount of $35,000 per mile. It was understood the New York capitalization was $10,000 per mile. Mr. Meyers, of Cambridge, the father of the anti-stock-watering laws of Massachusetts, therefore, on the next reading, May 20, secured the substitution of a bill, giving the same location, but providing for only an issue of bonds equal to the capital stock subscribed and paid in, and made the company subject to all the anti-stock-watering laws of the state. Its franchise is dependent on the location and construction of the road before July 1, 1900, and also becomes void if the petitioners do not within one year make due application in seasonable time for a Massachusetts charter. This bill was engrossed by the House the same day and after some discussion in the Senate was passed by a narrow majority and was enacted June 10.

Among the general railroad bills of the year was an amendment to the grade crossings law, which makes it applicable to private crossings at grade, except that the entire expense shall be borne by the railroad, excepting only when the abolition is in connection with that of a public way. Col. J. H. Benton, Jr., counsel of the New Haven road, attempted to get a change of the grade crossings law, so that no payment shall be made for constructing a bridge to separate grades, under the provisions of the general law, unless by decree of the court. This was adversely reported, and the report was accepted. A bill to permit steam roads to operate branch roads in the public highways by electric power was adversely reported, and the report was accepted.

A bill was passed which makes the anti-stock watering law of 1894 apply to the issue of coupon notes and other indebtedness payable at periods of more than 12 months from the date thereof.

The greatest railroad fight of the year came upon the bill to permit a railroad corporation to purchase the shares of capital stock, or any part thereof, of any other railroad corporation whose road is leased to or operated by it, or of which it owns the majority of the capital stock. This was called the "Boston & Maine" bill, and that road worked hard for its passage. The design was to make it possible to purchase more of the stock of the Maine Central road and to increase its capital and bonds for the purpose, in order that double-tracking and other improvements of the latter road might be made without the Boston & Maine losing its control by the sale of the necessary securities to outside parties. Maine and New Hampshire had passed a similar bill, but every unfriendly influence connected with other roads was brought to bear, and it was fially defeated in the House, after passing the Senate. Had the other roads assisted the Boston & Maine, or had the real purpose of the measure been better understood, the result might have been different.

An attempt to amend the "Spark bill" in relation to fires communicated by locomotive engines was defeated.

The Railroad Commissioners recommended that the duties of railroad inspectors be extended to the examination of the roadbed, tracks, crossings, stations, rolling stock equipments, appliances and grounds of street railways as well as railroads. This bill was favorably reported and enacted.

A law was passed for the appointment of a commission to investigate and report upon the relation of street railway companies to cities and towns, and to recommend legislation if any be needed. There was some feeling that this meant a permanent street railway commission, and to head any such thing off the Committee on Ways and Means had the bill changed so that there should be a "committee" instead of a commission, whose duties should terminate when their report was made. The bill provides that the body shall consist of three able and discreet persons, . . . to consider taxation of street railways and their franchises, to establish a more equitable method of taxation. The compensation of the chairman is to be $3,000, and of the other members $2,500 each, annually. The street railways are to bear one-half the expense, and the Commission is to report Jan. 1. 1898.

There was a long fight on the question of vestibules for street cars in cold weather, which culminated in the passage of a bill on June 2, providing that all cars purchased, built or rebuilt by any street railway company after Jan. 1 next, and used for the transportation of passengers during January February. March, November and December, shall have enclosed platforms to protect the motormen, conductors and other employees. The company (also the superintendent or manager) is liable to a fine of not less than $50 nor more than $100 for violation of this law, and officers may be committed to jail in default of payment.

A bill to permit street railway cars to carry crushed stone, gravel, sand and other road material, put in by Mr. Newcomb, of Quincy, in the interest of the granite quarries of this city, successfully ran the gauntlet of the House, but was killed in the Senate.

A number of small street railways in country districts were given the rights of common carriers of parcels, but the Legislature adhered to its rule of prohibiting this except in a limited way.

The Haverhill, Georgetown & Danvers Street Railway Company asked the right to cross the track of the Newburyport branch of the Boston & Maine road at grade. There is a "Y" at this point, so that the crossing was very wide, and there was a good deal of opposition. The Milford, Holliston & Framingham Street Railway asked for the right to cross the Milford branch of the Boston & Albany in the same way. In the case of the first, the crossing was the key to central Essex County, and would connect the Merrimac valley lines with those of Lynn and Boston. It was granted, and as a natural consequence the Milford road's crossing was granted also, thus saving an unpleasant transfer at each point. Neither of the steam roads has frequent trains.

The Boynton "bicycle" bill got through. It incorporates the Boston, Quincy & Fall River Bicycle Railway Company. Eben Moody Boynton, with Gen. O. O. Howard, Albert H. Overman and others are the incorporators, and the bill was carried through despite the fact that the people of Quincy, Braintree and other places, through their town governments, protested that their control of streets was endangered. The bill has many restrictions, however, the amendments which went on in the Senate during the last day of the session being of so stringent a character that it is doubtful if anything is done with the charter until another legislature amends it. All rights under it are forfeited if 20 miles are not built within two years. Its damage clauses are particularly stringent.

A bill was enacted to permit street railway companies to furnish motive power and make contracts for street sprinkling.

The Brockton Street Railway Co. was authorized to carry packages. The Southbridge & Sturbridge Co. was authorized to act as a common carrier. The Barre Street Railway Co., which was given a charter, asked the same right, but it was refused. The Reading & Lowell road was empowered to buy all its connecting lines already operated by it.

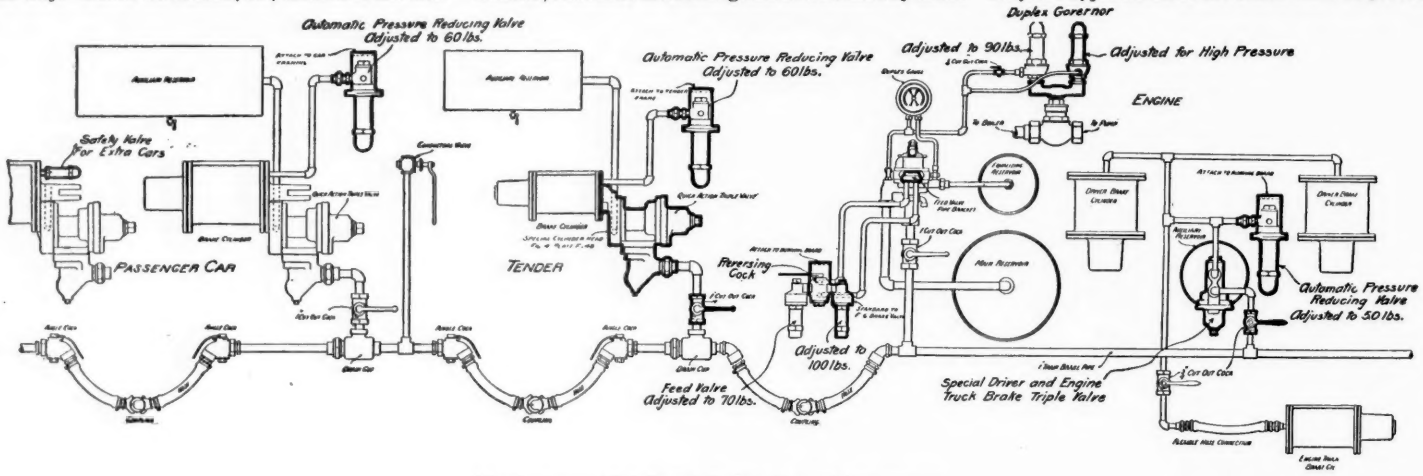
Legislation asked by Representative Myers, of Cambridge, was passed, permitting consolidation by purchase with connecting lines, provided such purchase is agreed to by a majority of the directors and two-thirds of the stockholders of each road. There may be an increase of stock and bonds by the purchasing company according to law, but it shall not be larger in the aggregate than the capital stock and debt of the two companies. The Street Railway Committee added a provision that the purchase must be approved by the Railroad Commissioners, and also that the facilities of travel shall not be diminished.

The Westinghouse High-Speed Brake.

For a number of years the Westinghouse Air Brake Co. has been developing and bringing to perfection an attachment to the quick-action brake which will secure the immensely desirable result of using a variable brake-shoe pressure. Something of the record of the progress of these experiments has appeared in our columns in the last four years. Naturally, the brake company has been deliberate in offering the high-speed apparatus for general use, because it is of the greatest importance that its absolute reliability should be determined in service. The time has now come when the apparatus can be confidently offered, and the illustrations which we give and most of the description which follows are taken from a special book on the high-speed brake, which will be issued to the railroad companies in a few days.

The Westinghouse quick-action brake, using the higher pressure, as is made possible by the special high speed attachment, will stop passenger trains in emergencies in about 30 per cent. less distance than is required with the best brakes heretofore used. The superior stopping capacity is obtained by increasing the standard air pressure of 70 lbs. to about 110 lbs. The distance in which a train can be stopped from a speed of 40 miles an hour is nearly twice as great as that from which it can be stopped from a speed of 30 miles an hour. At 50 miles an hour the stopping distance is more than three times as great as that required at 30 miles an hour and nearly twice as great as that required at 40 miles an hour. At 60 miles an hour the distance required for stopping is about five times as great as that required for 30 miles an hour, and more than two and one-half times as great as that required at 40 miles an hour.

In addition, the frequency of meeting danger signals—and, therefore, the frequency with which applications of the brakes are likely to occur—increases directly with the speed. It is therefore important that unusually frequent applications of the brake shall be provided for without seriously impairing the ability at any instant to promptly and effectively respond to an emergency.


Automatic Pressure Reducing Valve Adjusted to 60 lbs.
Safety Valve for Extra Cars
PASSENGER CAR
Automatic Pressure Reducing Valve Adjusted to 60 lbs.
TENDER
Feed Valve Adjusted to 70 lbs.
Duplex Governor
Adjusted to 90 lbs.
Adjusted for High Pressure
ENGINE
Pressing Cock
Adjusted to 100 lbs.
Special Driver and Engine Truck Brake Triple Valve
Automatic Pressure Reducing Valve Adjusted to 50 lbs.

Westinghouse High-Speed Brake—General Arrangement.

The Heavy Lines show Special Parts.

During the progress of the Westinghouse-Galton experiments in England in 1878, special mechanisms, of a somewhat delicate character, were employed with the old automatic brake to regulate a variable pressure of the brakeshoes upon the wheels—beginning with a considerable pressure at high speeds and reducing to a moderate pressure when the speed became much reduced—whereby much shorter train stops were secured than had ever been attained in any other way. No practical application of this apparatus was made in regular service, however, chiefly for two reasons: One was that the conditions of regular train service did not appear at that time such as to necessitate the utilization of this principle; the other was that the regulating appliances there used were of a somewhat delicate and complicated nature, which appeared to be inconsistent with that complete reliability which must characterize an air-brake apparatus. With the invention of the quick-action brake, however, the presence of the emergency brake prepared the way to a practical application of the principle so long ago discovered, by means of simple and reliable mechanisms.

The apparatus of the high-speed brake is simple. It consists of the quick-action air-brake apparatus—to which is added an automatic reducing valve, to be secured readily to the car sills or to any point in the vicinity of the brake cylinder, to which it is connected by means of suitable piping. It is only necessary to add this pressure-reducing valve to the quick action brake apparatus, already in use on any passenger car provided with standard brake gear, to convert the apparatus into the high-speed brake.

This automatic pressure-reducing valve remains inert in service applications unless the brake cylinder pressure becomes greater than 60 lbs. per square inch (for which the pressure-reducing valve is ordinarily adjusted), in which case the valve works to discharge from the brake cylinder so much air as is necessary to restrict the cylinder pressure to 60 lbs. Thus, the maximum brake cylinder pressure, in service applications of the brakes, is restricted to 60 lbs., regardless of the air pressure normally carried in the train pipe and auxiliary reservoirs,

In an emergency application of the brakes, the violent admission of a large volume of air to the brake cylinder (only made possible by the quick action feature of locally venting the train pipe) raises the pressure more rapidly than it can be discharged through the capacious service port of the reducing valve, and the port thereby becomes partially closed, restricting the discharge of air from the brake cylinder in such a manner that the pressure in the brake cylinder does not become reduced to 60 lbs. until the speed of the train has been very materially decreased.

The pressure in the train pipe and auxiliary reservoirs is increased from 70 lbs. to about 110. With this pressure in the train pipe and auxiliary reservoirs, an emergency application of the brakes almost instantly fills the brake cylinders with air at nearly 85 lbs. pressure, thereby increasing the braking force from about 90 per cent. (the customary standard) to about 125 per cent. of the weight of the car; or, in other words, the pressure of the brakeshoes upon the wheels is about 50 per cent. greater at this instant than is realized by the mere use of the quick-action brake. The air pressure immediately begins to escape from each brake cylinder, through the automatic reducing valve, and continues to do so until the brake cylinder pressure becomes 60 lbs., which is thereafter retained until the brakes are released by the engineer.

On account of the high pressure normally carried in the auxiliary reservoirs (110 lbs.), a full service application of the brakes (charging the brake cylinders with air at 60 lbs.) may be made, and still leave the pressure in the auxiliary reservoirs at nearly 100 lbs. If, after releasing the brakes, a second application of the brakes should be called for before there has been time to recharge the reservoirs, there is abundant air yet stored in the reservoirs to make a second, and even a third, full service application, and still leave sufficient air pressure to make an emergency stop equal to that of the ordinary quick action brake. These advantages are coupled with such a restricted brake cylinder pressure for all service applications of the brake, that wheel sliding is entirely avoided. By simple additions to the brake apparatus on the locomotive the train pipe pressure is easily and quickly changed to 70 lbs. when the locomotive is used in other kinds of service, and *vice versa*.

Experience with the use of brakes upon the leading locomotive truck has demonstrated the entire practicability of applying brakes to the wheels of the engine truck, and proper security for high-speed trains requires the application of brakes to every wheel in the train. Trains scheduled to run at exceptionally high speeds are necessarily limited in respect to their weight and length, while powerful locomotives are required to haul them. Thus the weight carried to the rails by the leading truck of a locomotive is about one-twelfth that of the whole train. Neglect to provide brakes for the locomotive trucks upon such trains robs the stopping efficiency of the brakes by nearly 10 per cent. The use of the locomotive truck brake is therefore considered an essential in every case where the superior stopping efficiency of the high-speed brake is desirable.

The Automatic Reducing Valve.

The diagram shows in heavy outline the special high speed brake mechanisms used in combination with the existing brake apparatus on locomotives and cars, while in the numbered figures illustrations are given of the automatic reducing valve.

Fig. 1 shows a vertical cross-section and Fig. 2 a horizontal cross-section through the slide valve of the reducing valve, which is attached to some convenient point on the car or engine, by its bracket *X*, and is connected to the brake cylinder by piping thereto from union swivel 15, Fig 5, at *Z*. Chamber *b* is at all times in communication with the brake cylinder, and piston 4 is subject to whatever pressure may be therein, while an adjusting spring 11, on its opposite side, provides resistance to its movement downward, which is limited to chamber *c*. This resistance can be readily varied by adjusting nut 12. Combined with piston 4 is its stem, 6, fitted with two collars, between which slide valve 8 is carried and moved coincident with the movement of piston 4 when subjected to air pressure from the brake cylinder, and such pressure is in excess of the resistance of spring 11. Slide valve 8 is represented by cross-hatched lines in Figs. 3, 4 and 5, and is fitted with a triangular shaped port, *b*, in its face, which is always in communication with chamber *d*, while a rectangular form of port, *a*, is arranged in its seat and is always in communication with the outside atmosphere at exhaust opening *Y*.

In Figs. 1 and 3 the slide valve, 8, and its piston, 4, are shown in the normal position occupied so long as the pressure in the brake cylinder does not exceed 60 lbs. per square inch when used with passenger car brakes or 50 lbs. when used with driver brakes, suitable adjustment for either pressure being made by compressing or releasing the tension on spring 11. It will be noted that port *b* in the slide valve 8 and port *a* in its seat in this position are not in register and the pressure is therefore retained in the cylinder until the release of the brakes is effected in the usual manner.

When the pressure in the brake cylinder exceeds 60 lbs., with an ordinary service application of the brakes the pressure acting on piston 4 moves it downward slightly until port *b* in the slide valve and port *a* in its seat are brought into register, as in Fig. 4, enabling the surplus air to be vented to the atmosphere, when spring 11 forces the piston and slide valve to their normal position as in Figs. 1 and 3, closing the exhaust and retaining 60 lbs. pressure in the cylinder. The area of ports *a* and *b* is such that in performing the function just described they are enabled to discharge the surplus air from the brake cylinder to the atmosphere quite as rapidly as it enters the brake cylinder through a port in the slide valve of the triple valve of somewhat smaller area.

The position taken by the piston 4 and slide valve 8, in an emergency application of the brakes, is shown in Fig 5. The violent admission of air to the brake cylinder suddenly drives piston 4 throughout its entire traverse, until it rests on spring case 3, when the apex of port *b* in the slide valve is brought into conjunction with port *a*, and a comparatively restricted exhaust of the brake cylinder air takes place while the train is at its highest speed, gradually increasing as the pressure on piston 4 is lessened and slowly moves the slide valve upward, in a degree proportional with the reduction of speed of the train, until finally closing, the desired pressure is retained in the brake cylinder until released in the ordinary manner. In performing this function air pressure in a large volume is discharged into the brake cylinder from both the auxiliary reservoir and train pipe, through openings largely in excess of the area of ports *a* and *b*, which latter are consequently unable to discharge it to the atmosphere with equal rapidity, enabling piston 4 to be quickly driven throughout its entire possible traverse and the apex of port *b* is presented to port *a*, giving an area through which the excess air is slowly discharged to the atmosphere, but gradually increasing in a required degree as the piston and slide valve ascend to their normally closed position.

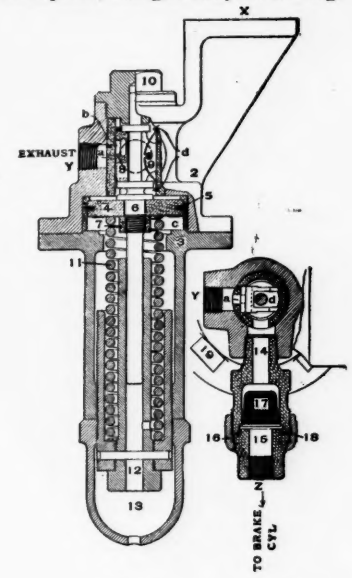


Fig. 1. *Fig.* 2.

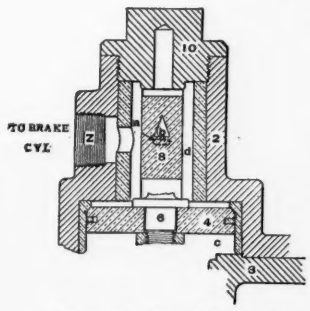


Fig 3.—*Position of Ports at Release.*

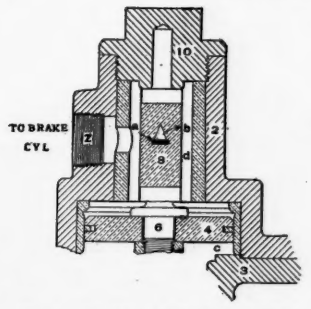


Fig. 4.—*Position of Ports in Service stop. Pressure exceeding 60 lbs. in Brake Cylinder.*

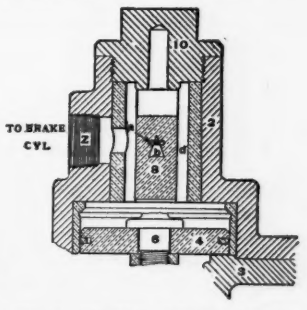


Fig. 5.—*Position of Ports in Emergency Stops.*

The Automatic Relief Valve of the Westinghouse High-Speed Brake.

When occasion arises for attaching extra cars, which may not be fitted with an automatic reducing valve, to high speed braked trains, some provision must be made for relieving their brake cylinders of the resulting high air pressure. For this a small safety valve may be quickly screwed into the oiling hole of the cylinder head and removed at the end of the journey. This safety valve is merely an expedient for an emergency, and its regular use is not advised, since a valve of this character cannot be entirely relied upon at all times to close with certainty and retain the required pressure in the brake cylinder, on account of the formation of its seat, on which particles of foreign matter may lodge and cause it to leak all of the pressure out of the cylinder, but such matter will be shoved out of the way by the slide valve construction of the automatic reducing valve, to which is added the advantage of lap in sealing the outlet or exhaust passage.

The high speed brake is operated by the engineman precisely in the same manner as if he were operating a train fitted with the ordinary quick action automatic brake, but it requires that the engine shall be fitted with a duplex pump governor, the diaphragm portions of which must be coupled in the usual manner with the main reservoir at the brake valve connection provided for this purpose. One diaphragm portion of this governor is adjusted to regulate the high air pressure used in operating the high speed brake; the other is adjusted to govern the pressure used with the ordinary braked train. A ¼ in. cut-out cock is placed in the air pipe leading to the diaphragm portion of the pump governor, which regulates the lower pressure carried, and should be closed preparatory to coupling the engine to a high-speed braked train. The diaphragm portion of the pump governor adjusted to the higher pressure will then govern the pressure compressed in the main reservoir. Similarly the handle of the reversing cock, to which duplicate feed valves are attached and suspended under the running board of the engine, must be turned to a position which will cut in or out, as may be required, either of the feed valves dependent upon the character of the train brakes to be operated.

Railroad Legislation in New York.

The Legislature of the state of New York has passed during the present year 15 bills affecting railroads, besides a considerable number of acts passed for the benefit of local interests, that is, affecting only one or a few railroads or only a limited territory.

Chapter 183 amends the penal code, section 635, prescribing penalties for interfering with the safety of a train. This section now provides for the punishment of crimes on electric railroads or against any of the apparatus or fixtures thereof, and also for removing a journal brass. The penalty for these crimes is, in case the safety of any person is endangered, imprisonment for not more than 20 years; in other cases for not more than five years.

Chapter 193 validates consolidations between domestic and foreign railroad corporations (notwithstanding the fact that the roads consolidated did not make a continuous line), provided an intermediate line owned or controlled made the desired connection.

Chapter 235 authorizes railroad directors, by a two-thirds vote, to change the location of a proposed road, provided the new line is in the same or an adjoining county; but the line cannot be changed in any town which has issued bonds for the road without the consent of a majority of the taxpayers, unless the terminus remains in the same village or city. No alteration shall be made in a city or village unless approved by two-thirds of the Common Council or trustees. A railroad may change its proposed terminus to connect with any railroad leading to an incorporated city. Any railroad may change its grade, except under certain conditions in Buffalo.

Chapter 369 amends the law requiring the payment of an organization tax. The railroad need not pay such tax until the State Railroad Commissioners are ready to grant a certificate authorizing the construction of the road.

Chapter 377 amends section 4 of chapter 39 of the general laws, regulating the assent by stockholders to mortgages.

Chapter 415 amends the labor law so as to limit the hours of labor on street, surface and elevated railroads to 10 hours a day, including one-half hour for dinner. No employee of such corporation shall be permitted or allowed to work more than 10 consecutive hours, including one half hour for dinner, in any one day of 24 hours, except in case of accident or unavoidable delay. This section applies only to cities of 100,000 inhabitants.

Chapter 416 also amends the labor law, making employers guilty of misdemeanor in case they require excessive hours of labor, etc., but the section containing these provisions seems to apply only to a person or corporation who "contracts with" the state or a municipa corporation.

Chapter 419 amends the code of civil procedure, adding new sections. One of these, section 3,419, says that a judgment to foreclose a mechanic's lien against a railroad corporation shall not direct a sale of the real property of the corporation; such lien is enforceable to the same extent as other judgments of courts of record against such corporations.

Chapter 484 amends the mileage book act of 1895; it requires mileage exchange tickets (given out in exchange for coupons of a mileage book) to be accepted by conductors without requiring the passenger to produce the mileage book, and it makes mileage books good until used.

Chapter 504 amends the railroad law, section 18, chapter 565, giving additional powers to corporations formed to do business in foreign countries.

Chapter 506 amends the penal code, forbidding the sale of tickets except by authorized agents. This is the

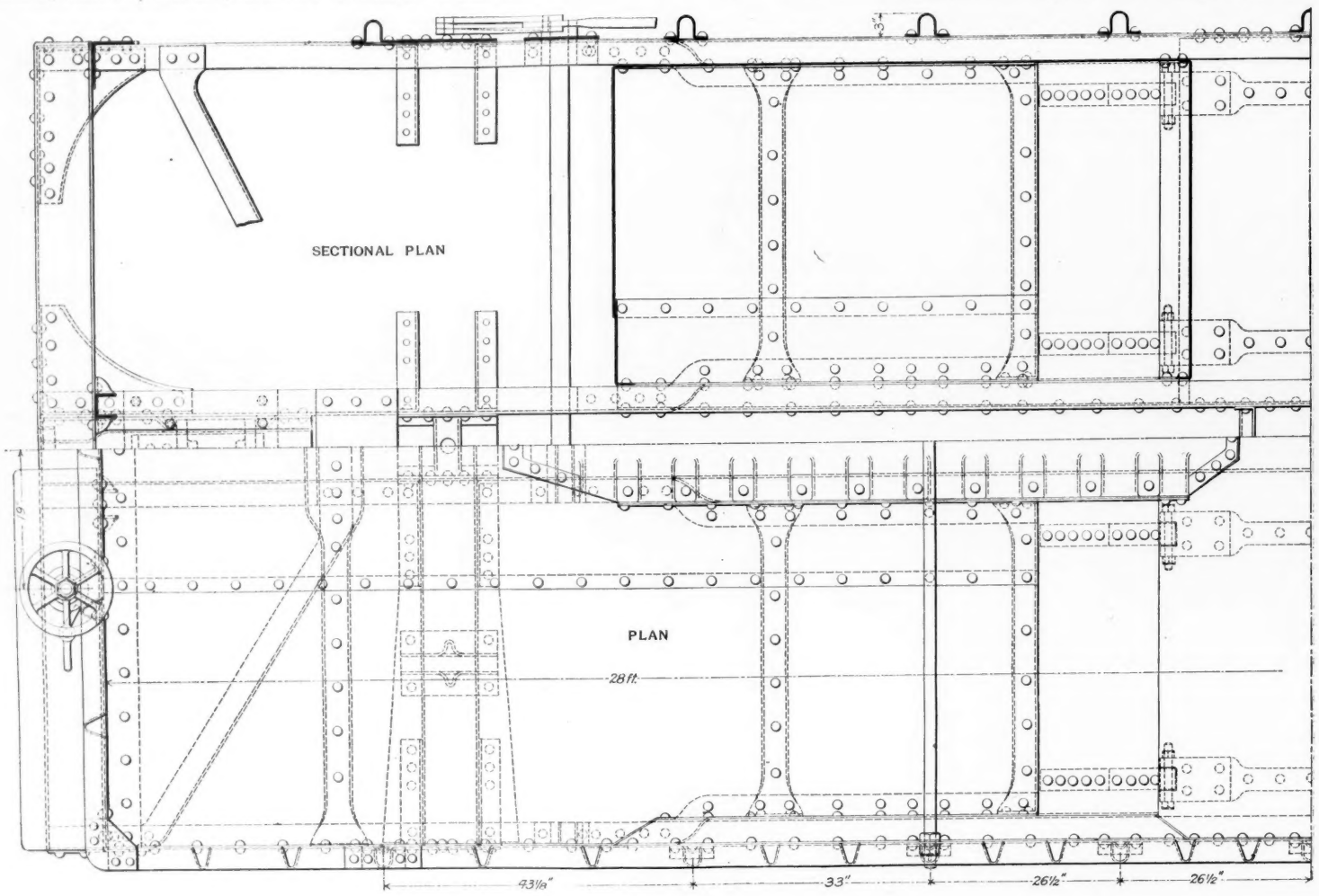
"anti-scalper law," already reported in the *Railroad Gazette* (May 28, page 375).

Chapter 548 amends the penal code, declaring the willful loosening of a rail, derailing a train, etc., murder in the first degree, if the death of a human being is caused, and making it punishable accordingly.

Chapter 663 authorizes the trustees of the New York & Brooklyn Bridge to contract with surface or elevated railroad company, purchase lands, rights or easements for making new or changing old crossings, or, if this cannot be done, may condemn.

Sec. 64 requires railroads to maintain the framework and abutments of overhead bridges, the town to maintain the roadway and approaches. At an under crossing the railroad shall maintain the bridge and its abutments.

portionment of cost, any judge of the Supreme Court in the judicial district may appoint a referee, and his report when confirmed by the Court shall be final. If the railroad fail or refuse to pay its share the town may collect it the same as in the case of taxes. If the town fail or refuse to pay, the railroad may institute suit or may offset against any taxes assessed against it by the town. The legislature shall appropriate annually $100,000 toward



Schoen Steel Car.

street railroads in New York or Brooklyn to carry passengers across the bridge.

Chapter 683 authorizes the Mayor of the city of New York to issue to policemen and firemen certificates of their appointment, such certificate to be valid as a pass for free transportation on any steam or electric car in the city. This seems to be the same law passed a year ago. It is entitled "an act to regulate the exercise of their franchises by certain public corporations."

Chapter 688 amends the law limiting fares on street surface railroads, allowing such roads, in villages and third-class cities, to charge 10 cents where the car overcomes an elevation of 450 ft. within 1¼ miles.

GRADE CROSSING LAW.

Chapter 754 is the grade crossing law and becomes a part of the railroad law (chapter 39 of the general laws), sections 60 to 69 inclusive, but crossings in the city of Buffalo, under the jurisdiction of the Grade Crossing Commissioners, and two crossings in Rochester, are excepted from the operation of the act. The act takes effect July 1.

Sec. 60 requires all steam surface railroads hereafter built, to be so constructed as to avoid all public crossings at grade whenever practicable to do so. The Railroad Commissioners, on application, shall determine whether crossings shall be under or over (or may declare a bridge impracticable). After due notice, hearing and publication, the Board shall render its decision within 20 days, notifying all parties.

Sec. 61. When a new street is built across a steam surface railroad it shall pass over, under or at grade, as the Railroad Commissioners shall direct. The municipal corporation shall notify the railroad 15 days before making the order for the street and shall give a hearing; then if it is determined that the street be necessary it shall apply to the Railroad Commissioners, who shall act substantially as required in Sec. 60. If the commissioners decide that a bridge is necessary, they shall determine the height, length, material, etc., if an over bridge, and if an under bridge shall decide the method and the grades; if a grade crossing, what safeguards shall be maintained. The decision of the Railroad Commissioners shall be final, subject, however, to the right of appeal hereinafter given.

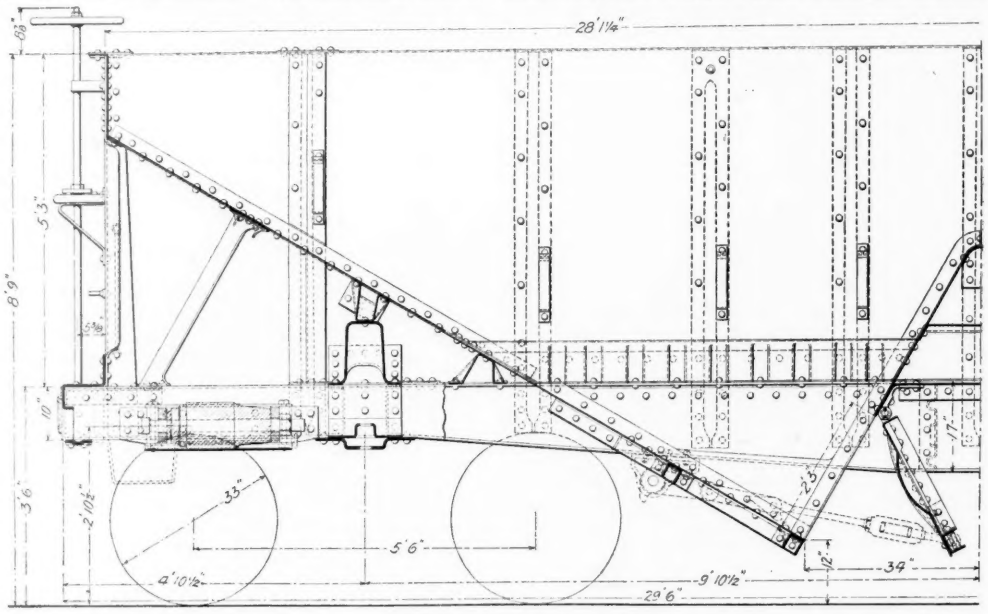
Sec. 62. Town and city officers may petition the Railroad Commissioners for the alteration of a grade crossing, and the Commissioners, after due notice, hearing and publication, shall determine what changes, if any, shall be made. Aggrieved persons may appeal to the Appellate Division of the Supreme Court.

Sec. 63. A city or town may, with the approval of the

Sec. 65. Whenever under Sec. 60 a new railroad is constructed across existing highways, above or below, the railroad shall pay the entire expense. Whenever under Sec. 61 a new street is made across an existing railroad, the railroad shall pay half and the town the other half; whenever a change is made in an existing crossing the railroad shall pay 50 per cent., the town 25 and the state 25. If there are two or more railroads each shall pay such proportion of the 50 per cent. as the Railroad Commissioners shall determine. Work done under Secs. 61

the state's proportion of the expenses of changes in existing grade crossings. Unexpended balances at the end of the year shall be applied to reduce the amount appropriated by the state in the next year. If the sum named is, in any year, insufficient, the first payment from the next year's apropriation shall be applied, and no subsequent change shall be ordered until the first-named obligation has been discharged.

Sec. 66. The Railroad Commissioners may, after suitable notice, order changes in grade crossings on their own



Schoen Steel Car—Longitudinal Section.

and 62 is to be carried on by the railroad, subject to the supervision of the Railroad Commissioners, and the expense of construction shall be paid primarily by the railroad company; the cost of additional lands, etc., shall be paid primarily by the town or city. Plans and estimates must be submitted to the Railroad Commissioners before letting the contract, and the Commissioners may employ experts and engineers temporarily to supervise the work, the expense to be made a part of the cost of the crossing. In case of dispute in the final approtion. The changes ordered by them in any one year must be distributed among the railroads and the towns or cities so as to produce equality of burden.

Sec. 67. If a town, city or person fail to comply with orders of the Railroad Commissioners, the Commissioners shall present the facts to the Attorney General, who shall proceed to compel obedience. The Supreme Court may issue mandamus, subject to appeal to the Appellate Division and to the Court of Appeals.

Sec. 68. Street surface railroads hereafter constructed

across steam railroads shall go above, below or at grade, as the Railroad Commissioners shall determine, and the apportionment of expense shall be determined by the Commissioners.

The Schoen Steel Car.

Last week, page 430, we gave a short account of the Schoen cars which were exhibited at the conventions at Old Point Comfort. These were two out of the 600

Schoen 100,000-lb. Steel Car.

100,000 lbs. capacity steel cars built by the Schoen Pressed Steel Co. for the Pittsburgh, Bessemer & Lake Erie Railroad, from the designs of Mr. Charles T. Schoen. We are able now to give illustrations of these cars in considerable detail, and in the brief description which follows we shall repeat some of the statements about these cars that we have published before, but we have some particulars not heretofore published.

Among the several remarkable points about these cars, we may specially call attention to the following:

(1.) The light weight (34,000 lbs.) of the structure, when its carrying capacity is taken into consideration, as compared with the weight of the ordinary car built mostly of wood. This light weight is obviously a large and continuous source of economy in transportation.

(2.) The symmetry and simplicity of construction. This was remarked by all who saw them. These points were effected by the innovation of the designer upon the old practice of designing metal structures. Instead of using rolled sections, such as channels, eye-beams and angles, as is common among structural engineers, he has resorted to the use of pressed steel shapes entirely, taking steel plate and pressing it into theoretically the correct shape to get the greatest strength with the least weight. For example, looking at the sills, it will be noticed that they are, say, 17 in. deep at the middle and 10 in. deep at the ends of channel section. A channel made in this way is just as strong for the strains to be met as though it were 17 in. deep throughout its entire length, and a saving of probably 30 per cent. in dead weight is made. This idea has been followed throughout the entire structure, with the result that, as it is estimated, a saving of about 4,000 lbs. is gained over the practice of using rolled sections, and probably 6,000 or 7,000 lbs. is gained over the use of a wooden structure of equal capacity.

(3.) A great reduction in the number of parts is effected. For example, the side sheeting is all one piece and flanged at top and bottom, thus avoiding the necessity of riveting angles around these points. The floor sheeting is flanged on the edges, making only one row of rivets necessary, instead of two rows, as would be the case were the floor attached with angles to the sides. So throughout the entire structure this idea has been carried out and the riveting required is only about two-thirds of what would be required for a structure of rolled sections. This reduction of parts is an important feature because aside from the other advantages it is one of the sources of economy in maintenance.

The construction in general consists of four main sills 10 in. deep at the end, and gradually increasing to 17 in. at the middle. The sides are of one sheet of steel, flanged at the top and bottom. The bottom flange is riveted with the top flange of the side sill, so that the entire side of the car may be considered as a girder. To the center sills are riveted two longitudinal hoods and one transverse hood, which also add materially to their strength.

In this particular type of car the body bolster has been put on the top of the sills, which reduces the height of the car from the top of the rail considerably. This body bolster is made of a rectangular piece of steel. The surplus metal, owing to the bolster being deeper at the middle than at the ends, forms a good gusset plate, which is riveted to the flanges of the side sill and side sheeting. A flange is also turned up on the end of the bolster, and is riveted to the side sheeting, which is reinforced by a rectangular plate on the outside, ½ in. thick. In addition to this the bolster is braced and tied to the sill by triangular shaped brackets.

The end sill of the car is pressed out of one sheet of steel, reinforced by gusset plates, which are riveted to it and the main sills of the car. The car is tied together by a transverse hood and hoppers, and several shapes, which can be seen on the drawings. It is equipped with the Westinghouse friction draft and buffing device. The axles have 5 × 9-in. journals and have about 3 per cent. nickel. It is probable that these 600 cars will be watched with more interest than any like number ever built.

The Master Mechanics' Convention.

We gave last week (pp. 427 to 430) abstracts of most of the reports presented at the Convention of the American Railway Master Mechanics' Association. A report of the proceedings of the convention follows, much abridged, however. The doings up to noon at the first session were given in our last issue. At that hour topical discussions were taken up.

No. 1 Piston Rod. Best design and material.

Mr. HENDERSON: I call the attention of the association to some tests which have been made of hollow steel tubes, with a view of using the same in locomotive piston rods. The tubes we experimented with were 3 and 3¼ in. outside diameter and a 2 and 2¼-in. hole extending through them, and of various qualities of steel as determined by tensile test. We designed an articulated crosshead, with the view of relieving the piston rods of transverse strain, by allowing the socket in the crosshead to swivel in the main body of the crosshead. We were well pleased with the result.

Mr. SAGUE: We have made designs for hollow piston rods, but have not yet put any in service.

Mr. HENDERSON: The weight saved is nearly 50 per cent. Of course the tube is higher in price, probably a little more than twice as much as the solid rods; but when you come to take into consideration the saving in weight the actual difference in cost is not much.

Mr. SINCLAIR: There is a gentleman here from abroad who has some knowledge of the use of piston rods in marine service, and perhaps he can tell us something.

Mr. PLATT: In England in connection with government torpedo practice hollow piston rods have been used. A great deal of study has been given to the subject. By the use of cold drawn metal in the shape of tubes, either in iron or steel, much better results can be obtained. Take a high carbon steel, cold drawn, and you get a material with much harder service and a tensile strength up to 100,000 [?] lbs. a square inch. They get 25 to 30 per cent. elongation, and get a material which may be worked into piston rods which will be very satisfactory. The engines which they use are 3,000 H. P.

Mr. BARNETT: I am not afraid of high carbon steel for piston rods after an experience I had some years ago, when a number of odd-size Krupp tires came into my hands. Having no use for them as tires, I cut them up and made piston rods of them. There has not been a single failure in these rods, and they are the best finished and surfaced of any rods in our service to-day.

Mr. HERR: I rather question the advisibility of articulation in the piston rods. A flexible connection crosshead has been tried frequently, and as far as I know never with success. The matter of enlarging the end of the piston rod to secure not only greater strength at points where breakage usually occurs, but also to give more flexibility, has not been mentioned. That is a valuable feature of design in which in general the American roads are behind the foreign roads. It is quite generally used abroad and is being used here also in some later designs. I know of engines which have been running for at least two years with that design of piston rod, and while I do not know entirely the results, as far as my information goes they are successful. Has anyone any results from the use of nickel steel in piston rods?

Mr. QUAYLE: We have had nickel steel piston rods in service, but not long enough for me to give information of benefit. For nearly 2½ years we have been using the enlarged end piston rod, nearly ½ in. larger where it goes into the crosshead, and the engines will average at least 7,000 miles a month, and been in that service continuously for 2½ years. We have not had any failure with them. I have no doubt we can reduce the diameter of the rod between the two connections. We can cut away the shoulder and distribute the vibration through the entire length of the rod between the shoulders.

Professor HIBBARD: I do not see why it would not be possible to roll a Mannesmann hollow piston rod, closed, and thus reinforced at both ends, which would require no upsetting, no welding of a piece into the interior for the true fits, no exterior shoulder. I have not seen it in use, however.

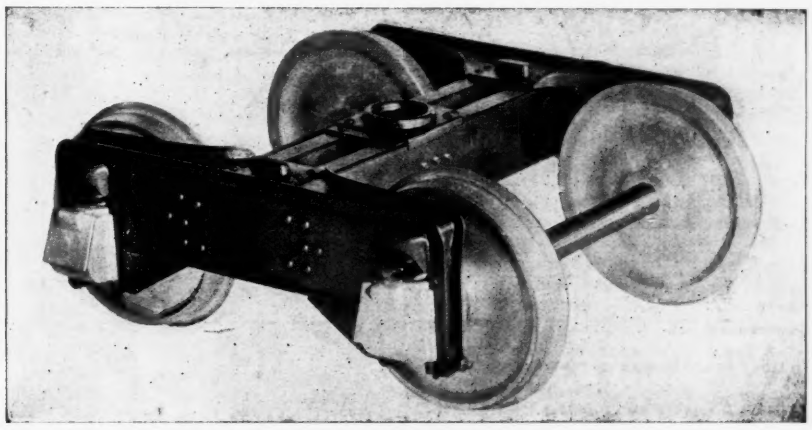
Mr. A. W. GIBBS: The Pennsylvania Railroad has experimented for the last four years with piston rods of the enlarged form with eminently satisfactory results, and not only did we find that it was an improvement, but they tried having the rods bottom in the crossheads so as to relieve the ends of the stretching caused by the ordinary method.

Mr. MACKENZIE: The point brought out by Mr. Gibbs in regard to the insignificance of the first cost of the steel, compared with the loss that might result from broken piston rods, is very good.

Mr. A. W. GIBBS: If you specify nickel steel you cannot specify the same amount of carbon that you would in a carbon steel.

Topic No. 2—Compound vs. Simple locomotives.

Mr. MORRIS: In 1893 the compound engine No. 140, on the C. & O., made the record which I gave at the meeting of that year. I have tabulated her performance since that time, and now after a four years' performance—one of the longest recorded comparative performances that has been made between engines of the same class, carrying the same steam pressure, and identical in every respect, except that one is a compound and the other are 10 simple engines—give some of the comparisons with the 10 engines for the entire time included in the four years. The total mileage in freight service of 10 simple engines was 396,633, or an average of about 139,666 as against the mileage of 165,187 for the compound—the percentage being 18.3 in favor of the compound. The repairs were about 1 per cent. more for the compound than they were for the average of the 10 simples. The oil and waste consumed for the greater mileage was .02 of 1 per cent. less. The fuel consumed for the increased mileage was 6.9 less than the total fuel. The compound in the four years made 19.2 more miles to the ton of coal than the average of the 10 simples, and ran 30.9 more miles to the pint of oil. The cost per mile in cents for repairs were .09 of 1 per cent.; for oil and waste 8 per cent. less; for fuel per mile 21.3 per cent less, and a total less cost per mile of 8.4 as compared with the 10 simple engines for the four years.

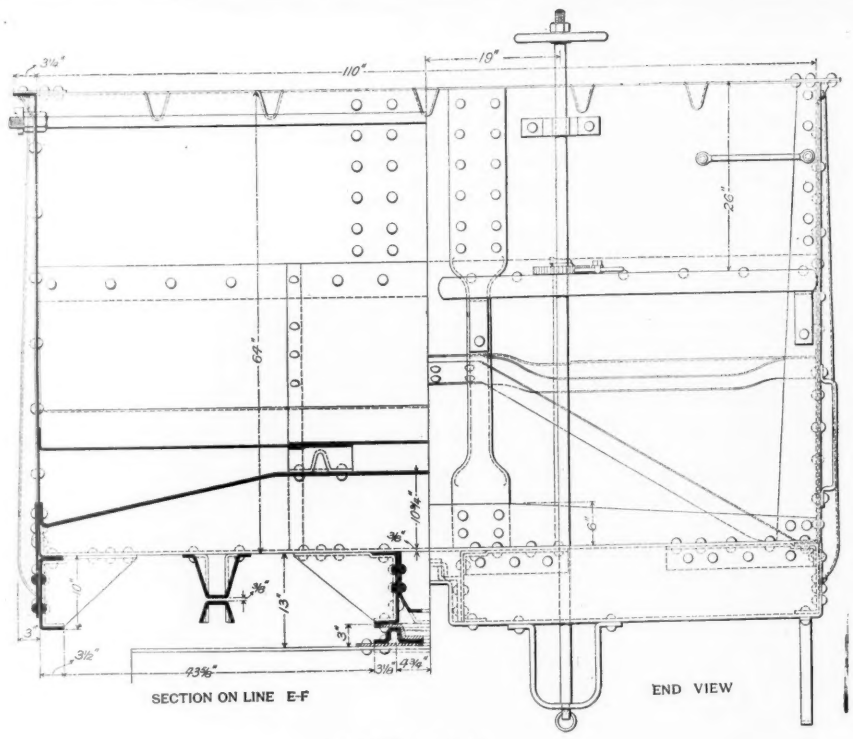


Schoen Steel Truck.

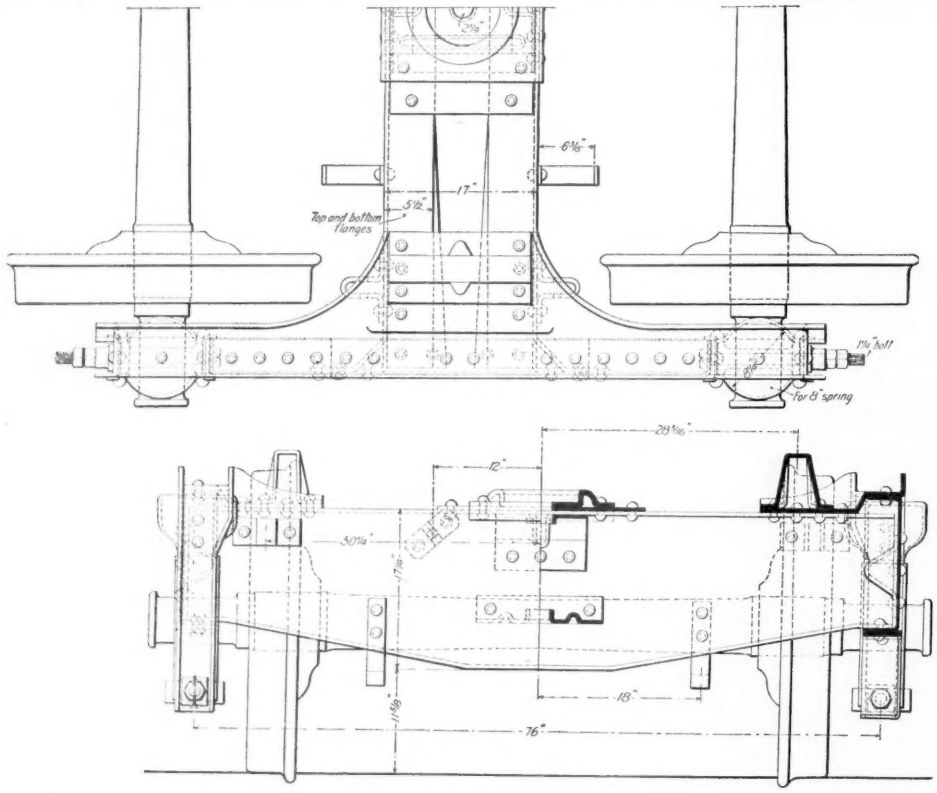
A little over a year ago we rebuilt or compounded six of our class G-5 engines, which are a change from the original G-4. It was designed to carry more steam, and we thought would make a successful compound, using our standard G-4 designs as far as practicable, excepting that we carried 200 lbs. of steam on the compound and 165 lbs. on the G-4 engine. The fuel performance of these six engines for the year ending Jan. 31, 1896, compared with six other G-3 engines for the same period during the previous year, was as follows: The engine mileage for the G-3 simple 119,000 as against 120,000 for the G-5 compound. The tons of coal for the simple engines was 7,667; for the compound, 8,456. The cars hauled per mile for the simples were 502, as against 652 for the compound. We expected that these engines would haul a greater tonnage, because they are heavier and carried more steam, but the fuel economy is entirely due to the compounding, and is 16.2 per cent. These engines were operated practically by the same men as the simple engines were during the previous year. Therefore we think that the comparison is highly complimentary to the compound engine.

Mr. GARSTANG: We have seven of the same compounds on the "Big Four" system. I find in making comparisons with one or two of the compounds as against 8 or 10 of the simple engines that the compounds will beat them out on coal consumption every time. In comparing three compound engines with three simple engines of the same class, on the same division, and in the same service, we find that we have saved in fuel consumption in favor of the compound between 15 and 17 per cent. These figures were taken from our monthly performance sheets. As far as oil, repairs, etc., are concerned, if anything I believe the compound is a little more expensive, but how much I cannot say.

Mr. GEO. GIBBS: We have compiled some figures from service tests on our road with four-cylinder compounds. During the last two years I have not exercised any supervision personally over the tests of compound locomotives. In fact, I desired to let the engines tell their own story. I had a record made of 21 Vauclain compound engines and 11 simple engines of the same build and exactly similar, except that the compounds carry 200 lbs. pressure as against 180 of the simples, but one of the simples does carry 200 lbs., and for the three years she has been in service we have not discovered any extra economy in the additional 20 lbs. The record is on a ton-mile basis. The record for the compound engine is on an average 12.11 lbs.; for the simple engine 14.57, or an average economy of the compound over the simple of 20.3 per cent. The variations in economy of the compound over the simple run from 25 per cent. down to 17.5 per cent. There is another conclusion to be drawn from this; at the beginning of the record the engines were new and the record extends to the first of February this year. The economy in the first month was the same as in the last, which is a good showing for the piston valve. My impression is that it is very seldom that we find a simple engine with a better economy than any one of the compounds; in other words, all the compounds stand above any one of the simple engines. One of these compounds we have had in service for about five years. I have not figured on the matter of repairs, oil, etc. Mr. Garstang spoke of the greater hauling capacity of the compounds being a point in their favor. Unless the simple gear is thrown in at starting they are not so powerful; but after getting to a speed of 8 or 10 miles an hour they are smarter than the simple. The starting gear can be thrown in, of course, at six miles an hour and under. The engineers themselves have found out very quickly that above that speed there is a difference.



Schoen Steel Car.



Schoen Steel Truck.

Mr. HERR: I ask each of the last two speakers to state the kind of service and the average speed made by the trains which these compounds hauled.

Mr. GIBBS: I do not like to say what the average speed is, but we have frequently made 230 odd miles inside of five hours. The engines are in express and local freight service on a division which has grades up to one per cent. as a maximum. The engine divisions are about 100 miles each and we frequently run the same engine over both divisions. They are 10-wheel engines with 63-in. drivers. A year ago we obtained two heavy express passenger engines and we have made as high as 10,000 miles a month for several months running. They have been in service only a year and are hauling trains up to 500 tons, exclusive of the engine, running 85 miles in 1 hour and 40 minutes. The train has 13 cars, from Chicago to Milwaukee.

Mr. GARSTANG: The average from St. Louis to Indianapolis is 700 tons, and the distance 265 miles. They make it in the neighborhood of 12 hours. The maximum grade is about 60 ft.

Mr. ATKINSON: We have had two types of compounds for about three years and a half and they have saved us nearly $2,000 worth of coal over the simple engine. As to speed, we never find the slightest trouble in running 50 miles an hour with a freight train, if we wished to do it, and we frequently do. We pay $2.70 a ton for coal.

Mr. QUAYLE: Two years ago I would not have spoken so favorably of the compound; there have been certain defects in it which have been overcome. The engines we have, both four-cylinder and two-cylinder compounds, have been so strengthened as to reduce the cost of maintenance very materially. We get an increase in freight service from 19 to 13 per cent. over the simple engine carrying the same steam pressure. I made some tests on the testing plant to discover wherein there was a difference in economy between the two simple engines, with the same heating surface, and in fact both of the same type, except cylinders. I concluded it must be in the cylinder ratio, one having 2.17, the other 2.49. In order to determine if there was any difference I bushed the high-pressure cylinder from 2.17 up to the ratio of 3. I found that I increased the economy in going from 2.17 up to 2.50. The curve showed a decided rise, and after we got to the 2.50 ratio it began to drop off in the same ratio it had increased, so that if we had put this engine into the service with the same ratio as the other we would have had the same result.

Mr. G. GIBBS: Will Mr. Quayle state if he made the experiments with different pressures? Does he think the ratio will remain the same for different pressures or the rate of pressure will change the ratio?

Mr. QUAYLE: The pressure was the same throughout the tests as nearly as it could be. This was not a road service test, but on the testing plant where we have an absolutely straight line, and not more than a variation of a pound in the steam pressure, which was 180 lbs.

Mr. ATKINSON: We have two compounds running on the same service, with steam pressure of 180 lbs. One has cylinders 19×29 and the other 19×30. The locomotive with the 30-in. cylinder drops water from the cylinder cocks all the time, while the other does not. There is undue condensation in the low-pressure cylinders.

Mr. HERR: Our road has 16 compounds of five different types—Richmond, Schenectady, Baldwin, Brooks and Pittsburgh. All of them are showing economy over the simple engines of the same class. In investigating this question of the relative economy of the compound and simple engines, it seems to be very important to know in what kind of service the engine is used. My experience is that the more severe the service in which the simple engine is placed the more economy will be shown by the compounds; in other words, we can expect much more economy in mountain service, with heavy grade from our compound engines than we can on the lower-grade divisions. It is also my experience that it is not fair to compare engines of different weights on drivers, and different heating capacity. Looking at this matter on a division having maximum gradients of $\frac{4}{10}$ I found that simple engines hauling 30 per cent. more train, showed an economy of 15 per cent. in coal, figured on the ton-mile from other simple engines working on the same district and the same kind of freight service. If these heavier engines had been compounds, you would have attributed it to the compound feature, when the greater hauling capacity of the engine is entirely re-

sponsible for it. We have in freight service with gradients of 1 per cent. an economy of 15 to 20 in favor of the compound. In the mountain service the economy is increased. It is fully 30 per cent. and in some instances higher. I consider from my experience that the compound engine has come to stay and is showing considerable economy over the simple engine.

Mr. VAUCLAIN: The industry in that direction is not flagging at all; that the tendency seems to be to use more compound locomotives; the percentage of compound locomotives is gradually increasing. Last year we built 173 compounds. We now have in service something like 800. The average railroad manager is beginning to find out two things: in the first place that a compound locomotive for freight service is not only economical, but that it is capable of hauling heavy loads at a higher rate than single-expansion locomotives, which is due entirely to the increase of boiler capacity owing to the low rate of water consumption. It is evident if the boiler is capable of evaporating a certain number of gallons of water per minute, the less the rate of water consumption may be the greater the total horse-power developed will be. The next thing is that for high speed passenger services the compound locomotive is all that it is ever claimed to be; compound locomotives are successfully performing the most exacting local service, many stops at short distances very economically, and that they are especially adapted to high-speed express service where large trains are to be handled. It is a very easy matter to maintain a high rate of speed with a large passenger train for a few miles going down hill, but to continue it for 50 or 60 miles, regardless of the undulations of the roadbed, is quite remarkable. The compound express engines hauling the fast freights on the Atlantic City road have shown an extraordinary amount of endurance. We indicated one of these engines toward the latter part of last summer, and were surprised to find on up-hill work, with grades of 35 and 40 ft. per mile, we had no difficulty in maintaining between 1,400 and 1,500 H. P. at a speed running from 57 to 60 miles per hour with trains of 14 passenger cars loaded and weighing over 500 tons.

Mr. ATKINSON: There is a general impression that after you get up to a certain number of revolutions per minute, that the simple engine is better and freer steaming than the compound. At present I am building some compounds, and so far as I know they will make as many revolutions as the simple engine, without increasing the back pressure at all.

Mr. MITCHELL: We are changing some engines into compounds with 68-inch driving wheels, and I consider the compound engine as fast in every respect as the simple engine. You can get up the speed quicker and make up lost time.

Mr. G. GIBBS: I have some drawbar pull curves. At low speeds, starting with the compound, it is not as powerful as the simple, but at 10 miles an hour the lines cross, and further on, at 40 miles, the compound has a much higher drawbar pull than the simple engine; no sign of falling off. These engines have run as high as 60 miles an hour in live-stock service.

Exhaust Nozzles and Steam Passages.

Mr. QUAYLE, as chairman of the committee, read the outline of the work of the committee as presented last year, which appears on pp. 58 and 59 of the printed report, and the conclusions as given on p. 72.

Mr. MCINTOSH: I have had considerable experience with this front end in a practical way, having 53 locomotives equipped with it on the divisions that I have charge of, and have yet to find one that cannot be made to steam with this equipment that can be made to steam at all. We find that there is a wide range of adjustment in the different parts that, with intelligent manipulating, will produce the combination required, in some cases an alteration of only 1 in. in height of pipe or diaphragm changing the engine from an indifferent to an excellent steamer.

Mr. HENNESSEY: Prior to June, 1896, our 10 wheel passenger engines on the Michigan Central were equipped with the long exhaust nozzles. The maximum opening at tip was 4½ in., an area of 15.90 sq. in., but this was an exception; the majority were 4⅜ in. diameter, or with an area of 15.03 sq. in. In the latter part of June, 1896, Mr. Robt. Miller took up the matter of the efficiency of our 10-wheel Schenectady passenger engine and decided to change some of them to conform to the suggestions and recommendations made on this subject at the convention of 1896. Patterns were made conforming as nearly as possible to the recommendations of the committee per print No. 6, and with arrangement of deflecting plates and netting as per print No. 21. After four engines were changed as per print No. 9, in in which the length of nozzle and tip was 27 in., with an area at choke at top of bridge of about 15.78 sq. in.; different sizes of tips were used from 4⅝ in. diameter, with 16.08 sq in. area to 4⅞ in. diameter, with 18.66 sq. in. area. The stack as per print No. 11 was used. It was found after using this arrangement (see *Railroad Gazette*, June 11 last) that enlarging the tip over 20 per cent. more than the area at the choke did not show the results expected. We then had a nozzle made as per nozzle print No. 11, which gave an area at choke or top of bridge of 20.1 sq. in., and used a tip of 4⅞ in. diameter, or area of 18.66 sq. in. We used this exhaust with good results. This nozzle was reduced 2 in. in length, or to 25 in. over all, instead of 27 in., as per print No. 9. Several petticoat pipes were used, but pipe as per print No. 4 gave best results. The engines that these nozzles were tried on were 19 × 24 in. cylinder; dimensions, 10-wheel. Schenectady passenger engines, No. of tubes, 247, 2-in. outside diameter, 12 ft. 6 in. long.

Heating surface of tubes	1,604 sq. ft.
" " firebox	137.1 "
Total heating surface	1,714.6 "
Grate area of	28.5 "

The comparative results of practical tests made with these engines with front end and nozzle arrangement as per prints Nos. 6 and 21 were as follows: From Aug. 1 to 15 Engine 277, pulling the North Shore Limited between Detroit and Jackson, with front end adjustment previously used as per print No. 6, with nozzle 4 9/16 in., made 29 35 miles per ton of coal with average train of 8 Wagner coaches weighing 620,450 tons. The number of coaches hauled one mile per ton of coal was 234. From Aug. 15 to 30, inclusive, with exhaust and front end arrangement as per prints Nos. 11 and 21, with tip 4⅞ in. diameter, the miles made per ton of coal was 38.38, the number of Wagner coaches and weight of train being the same as in former test. The number of coaches hauled one mile per ton of coal was 307, the time made, weather and general conditions being practically the same in both tests. A similar test was also made on freight on the Middle Division M. C. Railroad from Jackson to Michigan City—153 miles—with Engine 60, a new 10 wheel passenger locomotive built at Jackson from drawings furnished by the Schenectady Locomotive Works. This test comprised five round trips, or 1,530 miles. The first test was made with front end and exhaust arrangement as per prints 5 and 6, with exhaust opening of 4 9/16 in. diameter, which was the largest nozzle that could be used and obtain steam. The average miles made per ton of coal were 22 61.

Average tons per train	893.
Tons hauled one mile, per ton of coal	20.181

The front end and exhaust end arrangement was then changed as per prints No. 21 and 11, with opening at tip of 5 in. diameter.

Average miles per ton of coal	26.30
Average tons in train	923
Tons per mile per ton of coal	24.347

This shows a gain of 14 per cent. on miles per ton of coal, and a gain of 5 per cent. on ton mile haul. After I furnished Mr. Miller with the data of the tests that I had made, he felt fully warranted in making a further test with our lighter class of standard engines, with cylinders 17 × 24 in. diameter, inside diameter of extension front end of 52 in., with length of same 60 in. Several of these engines have been changed as per prints Nos. 12 and 18, and print of stack No. 10. The results of several tests were equally as satisfactory as in the larger class of engines. He was so well pleased with the general results of experiments made, both as to increased efficiency as well as economy in fuel consumed, that he has ordered all engines to be equipped in this manner as fast as they come to the shop.

Mr. HERR: On the Northern Pacific we are equipping engines with this style of exhaust pipe, nozzle and stack recommended by the committee, but have not yet had them in service long enough to speak definitely as to their performance. I endeavored to equip one of our largest consolidation engines with a 72-in. boiler. The object was to find out how the recommendations as to the proper distance between the choke of the stack and height of the nozzle would answer, when the boiler shell was much larger than it was on the engines on which the committee's tests were made. This engine is now running with 5⅛-in. single nozzle, while with the old high nozzle which was in before we made the change, with the straight stack, the best that could be done to make the engine steam is 5¼; she is now steaming better with the 5¼ nozzle, and we think we can enlarge it to 5⅝.

Mr. ATKINSON: After reading the recommendations of the committee, I first tried a single petticoat with a shorter pipe than we previously used, about 28 in., and found it a decided improvement. We tried a few engines that way, and then commenced to put them in exactly according to the recommendations of the committee, and found a very decided improvement. All engines coming into the shops for general repairs have been altered according to the drawings, 18-in. locomotives, 10-wheel, were formerly seldom ever worked with a nozzle larger than 4¼; we now get them up as high as 4¾, and we have not reached the limit. With respect to steaming, while we formerly had a great amount of trouble in the winter, and lost time, now we can get them to steam close to the full boiler pressure; formerly they burned a fire 7 in. deep, now they will not work with a heavy fire, and about 3 in. gives the best results. They frequently go into the terminal points showing the grate. If they get down, with attention the gage moves around rapidly, and in a few minutes we can raise the pressure 20 lbs.

Mr. COCKFIELD: We have about 75 per cent. of our locomotives equipped with the front ends recommended by the committee. We find our engines are freer steamers, with economy in coal, and we are enabled to increase our nozzles from ¼ to ⅝ in diameter. Before this standard front end was adopted we consumed on the Iowa division of the Chicago & Northwestern Railway, 7.36 lbs. of coal per loaded car mile. As the engines one by one were equipped with this standard front end we noticed a steady decrease in the coal consumption until under like conditions we were hauling the same cars with 16 per cent. less coal. This standard was maintained during the year 1896 with considerably decreased consumption during the summer months, and at the close of the second year we were hauling about the same number of cars with the same amount of coal as we did at the beginning of the year, showing very conclusively the advantage and economy of this front end. We do not attribute this wholly to the arrangement of the front end, but is largely so, as our engines steamed very much freer and naturally, therefore, consumed less coal.

Mr. SAGUE: We have equipped a large number of locomotives with the committee's front end, and in all cases in which we have received definite reports the arrangement has proven very satisfactory. This report gives exact information as to the laws which govern the exhaust jet and the laws which apply to the general arrangement of draft appliances. Following out the recommendations has resulted in free steaming locomotives.

Mr. RUFUS HILL: On May 18, 1896, one of our express engines was sent to shops to see if any improvement could be made in the draft appliances in order to make the engine steam better. About this time our attention was called to an article on smokestack and exhaust pipes which appeared in the *Railroad Gazette* of May 1, 1896. This article gave an account of experiments made by Von Borries. He gives the rule for designing a smokestack and also for ascertaining the diameter of the exhaust nozzle. We followed the rules and equipped the engine with a smokestack made accordingly. The results obtained with this stack on the passenger engine were very gratifying, this engine being required to haul a train varying from five to eight cars, 81 miles at 45 miles per hour. The engine burned soft coal and the boiler was rather too small for the work required. In previous years the engineman had hard work to make schedule time and was invariably late; with the experimental stack the engine was able to make time through the heavy summer season. In the fall the engine was shopped for a larger boiler and the stack was dispensed with. While the engine was able to make schedule time it was done by an increased coal consumption.

The difference between the stack shown as Von Borries' design, and that recommended and shown on Plate 48 in the report of the committee on "exhaust pipes and steam passages," made at the Master Mechanics' Convention in 1896, is that the exhaust nozzles are somewhat nearer the choke diameter of the stack, and also that the exhaust nozzles instead of being as low as possible, as recommended by the committee, are located above the center of the smokebox.

The results obtained with this stack, which, as above mentioned, is almost alike in dimensions, for both passenger and freight engines, seem to bear out the conclusions, and yet if the dimensions called for by Von Borries had been closely adhered to, no doubt the results would have been still better, therefore, we are still of the opinion that the stack should be designed according to some general rule for each class and size of engine, and we firmly believe, that in connection with the stack, if some attention was given to the arrangements in the smokebox, firebrick arch, grates and exhaust nozzles, the saving in the coal consumption would be marked. The final tests and arrangements of all these details can only be made when the engine is in service.

Mr. FORSYTH: As a member of the committee it is gratifying to know that the introduction of the exhaust pipe and nozzle which we recommended has met with such good results; but in talking about it, if we have met with any failures, or there is anything wrong about it, that part should also be stated. We applied this pipe to quite a large amount of engines of different classes, and the first thing we found in doing so was that we made the size of the choke the normal size of the nozzle, and then continued to enlarge the nozzle, and it made little difference in the effect on the fire; in other words, the area of the choke is the virtual area of the nozzle. I think a great many have been deceived into thinking they are running with a large nozzle when they are running with a small choke, and the effect on the fire is perhaps wasteful, when they imagine they are doing a good thing, because they have a large exhaust exit, and really have a small exhaust blast area. The practical application of this is in making the patterns for exhaust nozzles that the area of the choke should not be made exactly as the committee recommended, namely, equal to the diameter of the exhaust tip in area, but it should be made of an area equal to the largest exhaust tip you expect to use, or larger. If this choke is made equal to the normal size of the nozzle, it is liable to become gummed up gradually by the lubricants and grease which come through the nozzle, and it will become smaller; so that while we may think we are running with 5-in. nozzle, we may have the exhaust area in the choke reduced, and that is the reason for making the choke larger than 100 per cent. of the nozzle. This relation of the choke to the final exit is the most important part of the proportions which the committee have recommended, and I would urge the members to be careful that they do not deceive themselves in allowing the choke to become smaller than the area of the final exit.

Mr. MAHER: We made a test according to the report of the committee, and I found the application of the petticoat pipe proved detrimental in our case. I took the petticoat off and got better results. I was not able to increase my nozzle from ¼ to ⅝ without having back pressure. I thought as long as there was no back pressure, at 4⅝ we would adopt that as standard. At that point the engines steam freely and show no back pressure. I have increased the miles run per pound of coal; it is the cheapest kind of Illinois coal, and is very poor. Previously I had the high nozzle, and could not get anywhere near the results out of the engines.

Mr. QUEREAU: We have about 15 engines with the

front ends. I can duplicate what has been said. We have omitted the petticoat.

Mr. HERR: I think in justice to the committee that attention should be called to the third recommendation, which they give, stating the limits; it does not state how much more it should be, but that it should not be less. In conducting experiments on the testing plant for the committee we investigated the relative proportion of the area of the choke to the nozzle, and it ranged from 60 up to 1.6 per cent. The larger opening of the choke up to 100 per cent. gave an improvement; above that there was no improvement noticed. One object of the choke is to get the steam directed more centrally with the stack; in other words, to condense and direct the jet in the best manner. Professor Goss says the more condensed the jet the higher the efficiency.

Mr. FORNEY: We have heard a good deal about the superior economy of the compound engines, and now we hear of the superior economy of the exhaust arrangements. If you will allow me to have control of the choke, with a compound and simple engine, I think I could show a superior economy for the simple every time.

Mr. LAWES: On the Chicago & Eastern Illinois we equipped six engines in the roundhouse according to the recommendation of the committee, after putting in new flues, but when it came to the question of coal consumption they did not go to the head of the list.

Mr. MCCONNELL: We do not use anything but the diamond stack on the Union Pacific Railroad. A number of years ago we used extension front ends and the straight stack, which were in service about six years. Five years ago we commenced taking them off and equipping the engines with the diamond stack. We have made a great effort in the direction of train hauling. In '96 we ran 2,038 less trains than in '95. We handled 3,700 more cars. We made 9,100 more car miles and burned 19,000 less tons of coal. We have reduced the coal consumption for all the service in five years 2.61 pounds per car mile. In freight service now on our grades and level we are burning about 6 pounds of coal per car mile. We have increased our train haul 32 per cent. We have decreased the coal consumption 24 per cent. and we are still continuing in that direction.

Counterbalancing Locomotives.

Mr. HENDERSON: I am glad that the recommendations made last year are still in force. The second clause of the recommendations read: "Distribute the remainder equally among all driving wheels on one side, adding to it the weight of the revolving parts for each wheel on that side." I understand the best practice is to distribute the reciprocating weight in proportion to the balance among the other wheels. In other words, as long as you get the reciprocating weights balanced among the wheels on that side, I do not think it makes any difference if they should be equally divided between all the wheels. We might have an excessive weight on one wheel, which would not be likely to be increased by the overbalance due to the reciprocating parts. In that case we might wish to put more on some of the other wheels, which would take this extra balance without damage to the rails.

Mr. LEEDS: Some eight years ago we found a great many bent rails, and they were not only bent vertically, but sidewise, at points alternating exactly half of the circumference of the wheel. They were perfectly balanced as far as weights in the wheels were concerned; 45 in. centers, 3 in. tires. I found by following up the speed indicators that they never bent a rail at less than 55 miles an hour. We at once counterbalanced the engines properly as nearly as we could. The main driving wheels we left from 100 to 150 lbs. light. We have not had a bent rail since the distribution of the counterbalance where it belongs. I do not think it is practicable to reduce the counterbalancing in an engine weighing less than 130,000 lbs. to a point less than the recommendation of the committee.

Mr. FORSYTH: Counterbalancing, as far as it relates to the riding of the engine, is no longer difficult; the question is the maximum allowable weight on the rail and what is the maximum stress in the rail. I think we have reached the point in this question where we ought to have the assistance of the American Society of Civil Engineers and the rail manufacturers in giving us some information as to what maximum stress can be allowed in different sections of rail.

The Apprentice Boy.

Mr. VAUCLAIN: There are a number of manufacturing establishments in the country which are considering this question very seriously and are engaged in formulating a series of indenture papers. I will draw attention to one item: the boy is expected for three months to be a helper in riveting for boiler work. We find it requires a man of not less than 200 lbs. to do that work, and it is a difficult matter to get me to agree to this.

Mr. SINCLAIR: In many shops the apprentice boy comes in as a mere laborer. He is kept at work on which he is handy for years, and there is no systematic course to teach him the trade step by step as in the old days. We should endeavor to change the opinions of the shop managers on this question, and have them arrange the work for the apprentice from year to year, something on the system of the Norfolk & Western, so that the apprentice will have a chance to learn the trade.

Mr. VAUCLAIN: We have mechanics who have been in our service for 45 years; we think it desirable to hold on to our old employees. We therefore feel that something must be done to handle the apprentice question, so that the apprentice will not interfere with the retention of the old employees. We contemplate that our apprentices will be permitted to obtain a thorough knowledge of the business, and at the expiration of the apprenticeship he will be paid his bounty, an amount sufficient to enable him to travel half way across the continent in search of a situation. He will then be discharged, and we will have the option of hiring him over at that time.

Mr. MORRIS: I move that a standing committee be appointed to report year by year to this association. Adopted.

Topical Discussions.

No. 3. Cylinder clearance. Is the large cylinder clearance common in American locomotives economical?

Mr. SINCLAIR: I believe locomotive designers are wasting steam by the enormous ports and steam passages which are used with modern locomotives. I investigated the fuel consumption of locomotives in England last summer. I could see nothing which favored the European locomotives except that they had shorter steam ports; but there is no doubt that the European engines are doing the work with 25 to 30 per cent. less fuel. The dictum here is to make the steam ports and passages as large as possible to get the steam into the cylinders as near the boiler pressure as possible. In stationary practice that is all right, where you can regulate compression so that the compression line will come up to the demand line at the beginning of the stroke, but this cannot be done with locomotives for the reason that the nozzle regulates the back pressure to a great extent. There is no difficulty in getting steam into a cylinder if it can be got out. Superheating of the steam is of great importance to the locomotive, because it tends to reduce the great condensation at the beginning of each stroke. It would be a good thing for those experimenting with locomotives to reduce the piston clearance to the lowest limits and find out what the effect will be.

Mr. HERR: I question Mr. Sinclair's figures, 25 per cent. economy of fuel. The English engines use a different kind of coal from the average coal consumed by American locomotives and the better perforn ance is due to that fact. There is undoubtedly a wastefulness in large clearances and contracting this space tends to economy.

No. 4.—Piston valves for simple locomotives.

Mr. FORSYTH: The subject of piston valves for simple engines has probably been referred to me because we happen to have two simple engines with piston valves, while the majority of engines in this country equipped with piston valves are compound. I do not know why there should be any distinction made in the service. The slight experience we have had with these two engines has shown one or two points of interest. It is rather difficult to set piston valves; one of these valves is in the saddle, directly under the steam chest, and quite long, and it is difficult to fix the port lines and their relation to the valve correctly. We had to have them set over quite a number of times before we got them right. We found that the ports in the bushing were not truly at right angle with the axis of the bushing and were slightly angular, so that the admission line, measured from below, was perhaps $\frac{1}{16}$ in. different from what it was above, and it is important in making bushings for piston valves to see that the port lines do not vary. We found also that the packing ring is really the cut-off point. We trimmed off the edge of the metal outside the packing ring and made it as smooth as possible to give the steam more chance to enter the port. In doing that we obtained an increase of mean pressure under the same conditions of 15 to 20 per cent. When made of large diameter and similar to the designs of Mr. Vauclain piston valves will wear very little and give good service; and, strange to say, the wearing of the packing ring is not so much on the circumference as on the sides, and that points to the importance of making the depth of the ring as great as possible. I believe with pressures of 180 lbs. and above they will be found to have advantages over the ordinary solid piston valve. Incidental to this is the freedom of the use of the reverse lever, where, with an engine under full steam at 200 lbs., it is possible to move the reverse lever easily and thus change the cut-offs at will. I believe that a portion of the wastefulness of some engines is due to the fact that the valves work so hard that it is difficult to change the reverse lever.

Mr. QUEREAU: It is difficult to put an Allen port into the piston valve, and in my estimation an Allen port is a useful thing with engines working as hard as we work ours.

No 5.—To what extent, and under what circumstances, is it permissible to use water on bearing surfaces of locomotives?

Mr. MITCHELL: We all know that water can be used on a journal and produce sufficient lubrication, so that the journal will not cut provided that the water is running constantly. I know a standard engine which ran three months with nothing but water on the journal and no trouble occurred. I think it is permissible to use water on the bearing surfaces of those locomotives which are liable to run hot when by so doing you can prevent a delay to an important passenger train.

Mr. HERR: I agree with Mr. Mitchell in his last conclusion, but will take exception to the statement that water is a good lubricant. I have known of certain kinds of bearings to run very successfully with water and no oil. I know of dynamos run for years without oil and perfectly successfully. The motion is very rapid, and the weight and conditions of pressure are rather abnormal and differ from what they are in railroad practice generally. I approve of the use of water in emergencies. The water need not be used on the bearing itself always, but on the parts which bear on the bearing to carry away the heat and allow the oil to do its work, such as rods, pins, etc.

Mr. GILLIS: I have seen a locomotive run for two months with nothing on the driving box but water. The shoes and wedges on the engine were badly cut, but the bearings and axles were in perfectly good condition.

No. 6.—Manual vs. automatic control of compound feature of compound locomotives.

Mr. SOULE: As I understand, compound locomotives of every kind have some sort of manual control, and I believe I am right in saying that in every compound engine there is a connection from the valve mechanism to the shaft, by which the engineer can at will change the working of the engine from compound to simple. I believe that is characteristic of all compounds. The question is whether it is better practically to have manual control or automatic control for changing the operation of the engine from simple to compound. In the Vauclain type, with which I am more familiar, the change is effected manually at the will of the engineer. The engine is started simple and continued until the conditions justify a change, when the engineer, by moving a lever, readjusts the valve mechanism so that the engine works compound. In most other forms of compound engines the change from single to compound is automatic, being accomplished through the medium of an intercepting valve. My leanings are in favor of the manual control, but in making this statement I have to acknowledge that my convictions are simply based on the fact that we have had successful results from that form of control, and have had little or no experience with automatic control. One of the penalties which you have to pay for having the automatic feature is additional parts to maintain, with additional risk of failure.

Mr. MORRIS: We have had no experience with manual control; ours is a modified automatic, wherein the engine will automatically go into compound after starting. If the engineer desires to work the engine simple, he simply operates an emergency valve.

Mr. HERR: As I understand the question it is as to which is more desirable, a compound engine which cannot be worked at all as simple, or one that can be worked simple during certain revolutions. I have locomotives of both types, and I will state that the only locomotive that has given us serious trouble is one not susceptible of being worked simple at will.

Mr. MITCHELL: There are times when you want to put live steam into the big cylinder, and that is the time you want manual control.

Mr. QUEREAU: Two years ago there were published in the proceedings of the Northwestern Railroad Club results of fuel records for two engines; one could be converted into a simple engine at will and the other could not. The fuel economy of the one which could be converted into a simple engine showed the best, because they would haul heavier loads. The coal which was used was divided into many more units and made less coal per unit.

No. 7.—Causes of irregular wear of cylinders of locomotives carrying high steam pressure.

Mr. BROWN: We find the wear on the top of cylinders more troublesome than it is on the bottom. The wear commences about an inch and a half or two inches from the end of the stroke and decreases toward the middle. Wear on the bottom we have been able to overcome by the use of extended piston rods and other devices, but if the wear continues more at the top than the bottom, it is a question whether the extended piston rod is going to be desirable. The question is, what causes this wear. It may be the difference in the quality of the iron at the top of the cylinders being confined in a mold adjacent to the mass of iron in the steam chest, which may be of softer quality and more porous. This being the fact, it could be overcome by the use of bushings, which are more likely to be of uniform quality. Could wider rings be used, perhaps, to overcome this? There is no evidence of anything being in contact with the top walls of the cylinder except the packing rings themselves. The packing rings are $\frac{5}{8}$ to $1\frac{1}{8}$ in. The bull rings and piston show no evidence of coming in contact with the wall of the cylinder at all, but they do show that boring the cylinder out and taking out what you would think would be sufficient to clean out the bottom, you find that the top walls are worn more than the bottom.

Mr. WEST: We found the same trouble after bushing the cylinders, and in abandoning the solid piston with the snap ring we overcome the wear. The solid piston in connection with the offset cross-head is the secret of the wear. With the alligator cross-head and sectional packing we have no trouble with the same character of iron

No. 8.—Lead for passenger, freight and yard locomotives.

Mr. COSTER: This subject was suggested by me with the object of directing attention to and stimulating interest in the very important advantages to be derived from the intelligent sacrifice of the full gear lead to that at the running cut-off; prominent among which advan-

tages are increase of power, decreased expenditure for repairs, fewer delays and less annoyance due to hot pins, driving boxes, etc , and in increased economy in the use of fuel, resulting from a better distribution of the steam.

Another object which I had in view in suggesting this subject for discussion was the discovery whether, in the opinion of this association, it would not be desirable to appoint a committee to further investigate some of the points developed by Mr. C. H. Quereau in his admirable paper on "Locomotive Lead," which was read at the February meeting of the Western Railway Club.

In this connection the following subjects occur to me as being worthy of further consideration:

1. When adjusting the lead, what should we consider the running cut-off for passenger, freight and yard locomotives, with both plain and Allen valves, especially in the case of the long-stroke engines now coming into use?
2. What is, approximately, the most efficient lead at the running cut-off for the above three classes of locomotives, with both plain and Allen valves, and what should be maximum and minimum limits of variation of the same?
3. What should be the maximum and minimum limits of full gear lead for the three classes of locomotives, with both plain and Allen valves?
4. What is the most desirable method of diminishing the lead—reducing the angular advance of the backing eccentric, reducing the angular advance of both eccentrics, increasing the lap, combination of methods, etc.?
5. It having been conclusively demonstrated by Mr. Quereau that in the majority of cases excessive compression producing the characteristic loop in the admission line of the indicator diagram results from pre-admission, rather than from early exhaust closure, excessive back pressure or deficient clearance, would not the proper adjustment of the lead at the running cut-off enable us to diminish the volume of the clearance spaces and obtain the resulting increased efficiency in the use of steam, without the disadvantage of excessive compression?

In a paper on lead for locomotive valves, Von Borries states that:

"For the determination of the most suitable dimensions for the width of the lead opening, the ordinary indicator cards give almost no assistance, since they do not mark the forward motion in the neighborhood of the dead points, or the internal frictional resistance of the machine. These mistakes are frequently made through an imperfect understanding of the case, since good admission lines can always be obtained by increasing the lead. As illustrating this statement it may be said that the first standard freight locomotive with an Allen valve and a large lead gave faultless admission lines, while the older and better working locomotives with the admission line falling off very decidedly; . . . it is, therefore, necessary to guard against accepting an indicator card as an evidence of the good action of the steam and the satisfactory operation of the valve motion. In this matter we must rely upon practical investigation alone in order to obtain trustworthy information."

In view of these considerations it appears eminently proper that this association, with its almost limitless opportunities for experimental investigation and acquisition of practical experience, should undertake the study of the important subject of locomotive lead, and thereby carry the development of the American locomotive still further toward that point at which, in the words of a distinguished engineer, we "attain the maximum economy in the use of fuel with the greatest efficiency of the machinery."

No. 9. Broken staybolts.

Mr. LAWES: Under the presumption that you will grant me permission to qualify the phrase, I shall be pleased to present to you a few thoughts on the subject of "Partially Broken Staybolts," which is a topic of much greater importance, since partially broken staybolts are the more difficult to detect. In fact, so far as my investigation goes, they are never detected under the old methods, and must be regarded with suspicion.

For some years hollow staybolts and drilled staybolts have been used to a limited extent, but for some reason, or no reason, neither one has been put into general use; although, as I believe, the protection afforded is invaluable.

To satisfy myself as to an inspector's ability to detect broken and partially broken staybolts, I have had the staybolts in 13 engines drilled during the past year. The plan adopted was to have the inspector locate all the broken staybolts he could find, after which the staybolts in the firebox were drilled, including those marked by the inspector as broken. In the first firebox tested in this manner the inspector found 39 broken staybolts. After drilling and testing under water pressure these were all found broken; and in addition to these we found 59 others broken, which the inspector was unable to detect by the hammer test. This surprising result led me to examine the broken staybolts critically, and I find that those detected by the hammer test were broken entirely off, while those found by drilling holes in the end were only partially broken off.

After testing the staybolts in twelve fireboxes, and finding the ratio of broken staybolts and partially broken staybolts about the same as in the first firebox tested, I concluded to try the method of testing under boiler pressure, and having a helper hold on while the inspector gave the hammer test, but with no better results.

I desire now to direct your particular attention to the thirteenth firebox tested for broken and partially broken staybolts by the two methods. I consider it the most severe comparative test of all, from the fact that three inspectors in turn did their level best to locate broken and partially broken staybolts by the hammer test; they having been informed that the staybolts were to be drilled after they were through with their inspection. They were given all the time they required to make a careful and accurate inspection. The result was that the hammer test located four broken staybolts and the drilling test discovered 46 partially broken.

A careful record of the broken and partially broken bolts detected in 13 engines shows that 400 were discovered by the hammer test and 619 by the drilling test.

To me these facts are conclusive evidence that partially broken staybolts cannot be detected by the hammer test, and I believe a great risk is run by either not drilling the ends or not using hollow staybolts, and that either of these precautions will prevent many boiler explosions with the usual verdict of "cause of explosion unknown."

The expense of the precautions here recommended should not stand in the way of preventing boiler explosions due to defective staybolts, as the cost for drilling is only about $3.75 for firebox containing 900 staybolts. I figure that the cost is only an apparent one. For example: if the 619 partially broken staybolts had not been drilled and tested in the 13 fireboxes referred to above, these partially broken staybolts in time would have become broken staybolts and the engines containing them would have had to be laid up, possibly when needed badly, for the removal of broken staybolts, which would have necessitated the removal of jackets, airbrakes, pumps, frame angle iron and other parts covering the staybolts, thus causing an additional expense over that, if properly attended to, in the shop while undergoing repairs.

It is my practice to turn engines out of shop with staybolts beyond suspicion, and I find that I have no trouble with them afterward. I recommend to such members of the association that do not use hollow or drilled staybolts, that they drill the staybolts in a few fireboxes, as described, and keep a record of the number found by the hammer test and by drilling them, and I am sure that they will be surprised at the results.

Mr. MACKENZIE: There is a far better method than drilling staybolts, and that is to increase the water space.

Mr. MCINTOSH: I unqualifiedly approve of drilling the bolts. From my experience of over 10 years I have found it to be a thoroughly reliable process; more so than any other I know of.

Best Metal for Cylinders, Valves and Valve Seats:

Mr. HENDERSON: The Norfolk & Western road is referred to in the report; the steel mixture consists of 20 per cent. steel castings, old steel springs, etc., 20 per cent. No. 2 coke iron and 60 per cent. scrap. From this you get a good solid metal, and in cylinder castings there seems to be less trouble from honeycombing, and the metal finishes more nicely than the ordinary cast-iron mixture. The mixture shows very regular results, and is about 24 per cent. stronger than the ordinary cast-iron mixture. Its constituents are:

Silicon	1.51	Sulphur	0.068
Manganese	0.33	Combined carbon	0.62
Phosphorus	0.65	Graphite	2.45

Mr. VAUCLAIN: During the last two years we have been thoroughly investigating the character of the iron best adapted for use in cylinders and valves After a carefully conducted and elaborate series of tests we settled upon the composition having the desired physical properties, and then calculated the cupola charges, disregarding entirely the brands or furnace grading of the irons, using our tests of the ore together with our knowledge of the losses that occur in melting as the bases of such calculations.

It was clearly shown that in order to have castings of uniform quality considerable care must be used in charging the cupola, the irons composing the different charges must be thoroughly mixed, otherwise the small pieces of metal or that having a low melting point will be first melted down, giving castings of entirely different characteristics from the same charge. Over 10,000 tests have been made in all, and while all the results have not as yet been systematically tabulated with a view of establishing a relation between the physical and chemical properties of cast iron, we have gone far enough to remove all doubt of the existence of such a relation. There is also quite a definite relation between the strength of the iron and the wearing properties, but it is wrong to assume that the harder the iron the better the wearing qualities. The shrinkage of an iron is generally assumed to increase with the strength, but this is not true with a properly mixed iron, for we can regularly run irons up to 32,000 or 33,000 pounds without increasing the shrinkage; on the other hand the iron that gave us the greatest trouble from shrinkage was an extremely soft, low tensile iron, 18,000 pounds. Our experience indicates that with proper composition an iron can have as high a tensile as 35,000 pounds without danger of the cylinder cracking. The tendency to crack bears a more definite relation to the shrinkage than to the hardness.

Regarding the tests in detail, perhaps the most interesting are the abrasion or wearing tests. It will be noted that up to 28,000 lbs the wear decreases rapidly as the tensile increases. The best wearing material ranged in tensile strength from 28,000 to 32,000 lbs. per square inch, but within those limits a given increase in strength did not show a proportionate increase in wearing qualities as shown in diagram 2.

Regarding the chemical properties there are perhaps more misconceptions concerning sulphur than any other element. Any defects that develop are invariably attributed to sulphur. We, however, found that an iron is undesirable for use in cylinders unless it contains a minimum of .07 per cent., and that it really exerts beneficial results up to .12 per cent. We aim to have our cylinder mixtures conform to the following specification:

Tensile, 27,000 to 33,000 lbs.
Combined carbon about .6 per cent.
Manganese about .35 per cent.
Phosphorus, .6 to .9 per cent.
Sulphur, .07 to .12 per cent.

Ratios of Grate Area, Heating Area and Cylinder Volume.

Mr. HERR: The report of this committee gives evidence of such a large amount of labor and such a vast application of interesting data, that it is exceedingly difficult to adequately discuss it without a great deal more preparation than I have been able to make. It covers a field which has been almost entirely neglected, heretofore, and gives, as I far as I know, the first comprehensive detailed information for the complete calculations of the principal dimensions for locomotive engines for different classes of service, and different fuel conditions. The thanks of the association are due to this committee for the admirable report.

It is interesting to note the great difference in the ratio of grate area to cylinder volume for the different classes of coal, the anthracite being so much larger than bituminous, which increase again appears in the small heating surface relatively to the grate area. The charts given by the committee are extremely valuable.

Professor GOSS: I wish to express my appreciation of the work of the committee. As a piece of analysis it is exceptionally fine. The accuracy of the conclusions depend upon the accuracy of the data upon which the analyses are made. I believe the committee has used as reliable information as they could find. It is of great interest because of the ingenious analyses.

Piecework in Locomotive Shops.

Mr. MCCONNELL: Previous to seeing the report of this committee, I have never been in favor of the piecework system in railroad shops; but on investigating all the manufacturing establishments we find that piecework is universal. In the Baldwin Locomotive Works 90 per cent. of their work is piecework; Schenectady works about 85 per cent. A number of railroad shops in the country have gone extensively into this. I believe that the time is coming when the practice will be quite common in most of our shops.

Mr. BROWN: On the Pennsylvania system we feel there is a unity of interest between the company and the men, which lies in establishing a price which will not only be to the benefit of the company but to the benefit of the men, and in which the company shares the additional money paid for the piecework. At our shops at Juniata 61 per cent. of the work is done by piece. The rate received per hour for day work compared with the rate received per hour on piecework is 12 or 13 per cent. better in favor of the piecework system.

There must be some reason which will appeal to the men as well as to yourselves. On these lines we have been endeavoring to combine two things, and for about six months have been making a test in connection with tools incidentally finding out what is the feed and speed with a character of steel which will do the best amount of work compared with its first cost, and in that way we are checking up the feeds and speeds of our machines with a view of establishing prices based on the amount of material which can be made in a given space of time. Another question is the sharing of the price paid for a job between the apprentice or helper and the machinist. We have a class of men whose age is from 18 to 21 years. They are men in size and strength, but they are not men in skill. They get a uniform rate which is less than what we pay our regular laborers. The age at which we will take a young man to learn a trade is 17. We do not guarantee to teach him, but do keep track of him and we keep a record of his progress every six months. Every six months he must be moved from the job he is working on and changed according to his ability. The first year he is in this class as a boy he is paid 8 cents an hour; next year 10 cents, and so on until he reaches the age of 21, when he gets 12 cents an hour, a man's lowest pay as a laborer. Any job he is working on on which there is a piecework price he is entitled to a portion of it, which is the question referred to above. Ordinarily the apprentice could get no share in the piecework price. They get their month's pay, and the machinist must have some compensation for the amount of patience he must exercise with the apprentice as a helper. We have adopted in our machine shop the system of putting the helper on piecework and call it "shop hands." The men who handle the material constitute a definite force, and we put on an additional charge for handling the material. In our boiler shop, where we do tank work, boiler work and frog and switch work, there is no such thing as a laborer, except two sweepers. It is an experiment and has been in operation over four months and is successful. The men under the circumstances earn, say, 13 cents an hour or a little bit more, and we have reduced the cost of handling material on our boilers alone something like 30 per cent.

We prorate the apprentice with the mechanic—that is, if the mechanic is a 20-cent man and the apprentice is a 10-cent man, the apprentice will get one-third of the cost of the job and the mechanic two thirds. We do not pay the apprentice any more, but that is the way it is charged. Whatever more the apprentice makes as a piece-worker or day-worker goes to the company. The mechanic will help the apprentice and instruct him and get him to where he can sometimes do as much work as the mechanic, and the company also reaps a benefit; and the apprencice gets his benefit by having some one take a hearty interest in him, and all around we get the best results.

Mr. BROWN: We made two exceptions in our piecework system; one at the start and one recently. The first was in flue work; we found there was a tendency to hasten that work unless man stood by and watched every flue being put in. Therefore, as flue work is one of the most important things, we thought it proper to leave it on day's work. The other case of exception, recently adopted, was the riveting. In the absence of automatic devices for securing the best results, the length of time the sets should be held against the rivet after it was driven in the boiler would vary, and where the pressures are high and your machine is somewhat close to the limit everything that you can do to secure absolute tightness and immovability in the rivet after driving must be taken advantage of. We had some experience with heavy shell boilers, high pressure, and in driving

rivets we found there was a tendency, paying so much 100 rivets driven, to pull off too soon. You can apply the piecework system to almost everything. It used to cost us a certain amount of money, something like $15 we will say, for handling the material on one class of boiler, blocking in and out for general erecting, handling sheets to and fro, and all that, and we have reduced it 30 per cent.; and the men who are doing the work, while less in number, are making more money than at the regular day's work rate. The first calking is done by piecework; we pay so much for it and they have to keep at it until the boiler will hold water. We put the water pressure on and it is necessary for them to calk the boiler till the gage shall stand at the required test. If they do not do the first operation right and honestly in the boiler shop they have more time to put on the second operation; the sum of the two is what we pay for.

Mr. HERR: The admission that there is any job in the shop which cannot be done successfully on piecework without endangering the quality of the work is a serious weakness in the piecework system. If the riveting cannot be done satisfactorily on the piecework system, there is other work, perhaps not so important as riveting, and the neglect of which will not be so marked in its effect immediately, yet, nevertheless, which will be susceptible of neglect. Why is it not desirable to make the riveters replace these leaky rivets on their own time, making piecework price for perfect work, and making them replace all the leaky rivets.

Mr. BROWN: That is what they have to do, but it costs a certain amount to get the rivets out.

Mr. HILL: The result of my experience is that we do not want any day's work of any description in the boiler shop. There must be a penalty for poor work, and the men are careful not to have the penalty fall on them. We have been very successful with piecework on boiler work, especially repair work.

Mr. DEEMS: In my experience, especially in the matter of setting flues, in putting in new flues, I have seen no trouble from establishing piecework prices and having them carried out successfully. I have followed it up quite a while and have had all the flue work done in that way, except caulking flues in the roundhouse in running repairs. Any piecework system not equally advantageous to the men as to the company is a failure; that is the secret of its successful operation. The men on the Midland system in England are the strongest advocates of peicework, and that must be true in any place where the system is successful.

Shop Motors—Steam, Air and Electric.

Mr. MCCONNELL: We are large users of air motors throughout our shops, but I found it necessary to caution our men in one particular, that is, when practicable the work could be done cheaper by hand. Over one drill press, where we had large work as well as small, I saw a mechanic take off a cylinder head from the drill press table with the air hoist when it could be done easier by hand. We find the air motor beneficial in our bad water districts in beating the flues when the flues become too tender to do service. Where the beating was done by hand we found the flues might run two or three days when they required rolling again. With the pneumatic hammer, using a small amount of air at low pressure, we can get a uniform blow, which will enable us to run the flues longer between rollings. In my judgment air is not a reliable means of applying bushing in rods and petticoat boxes, because if the bushing sticks a little the air compresses, and it will be retarded one instant and continued the next. The speed at which the bushing goes into the rod or driving box is not uniform. For bushing purposes I recommend water, as water will not compress. The committee touches on the reheating of air to be used in the motor. It is important so as to get better use of the compressed air. A combination of air and hydraulics have been used in a good many machines successfully. Compressed air to drive the ram to do its work and the hydraulics doing the work. That has been demonstrated to be very sucessful. I have some figures here which I will give for the interest of the members:

Electric motors are manufactured as small as 1¾ H. P., and cost,

1¾	H. P.	$137.50
3	"	167.50
5	"	236 25
8	"	292.50
10	"	367.50
15	"	467.50

The speed for 1¾ H. P. 1,800 revolutions.

3	"	1,800
5	"	1,700
8	"	1,600
10	"	1,350
15	"	1,200

The maintenance is about 2¼ per cent. of first cost. The cost of operation under favorable conditions, after plant is set up, is about $120 per year per horse-power for isolated plant of 100 H. P. and under.

Where motors are rented and power furnished, the cost is from $25 to $50 per year per horse-power, where coal can be obtained at a moderate price, and the power plant is operated by compound condensing engines, and under favorable circumstances.

To equip a shop with six motors from 1¾ H. P. to 15 H. P. and one 50 H. P. generator costs, for motors, $1,668.75, for generators, $1,100—$2,768.75. This does not include setting up or wiring. The principal item for repairs is brushes and turning up commutators.

Mr. BARNETT: I emphasize the remarks as to reheating the air. Very few realize how simple the operation of rewarming the air is when you use a reciprocating motor. Of course, if you use a rotary motor you cannot gain any advantage by rewarming the air, as so few of these tools are designed to take out any thermic effect in the motive power. For instance, using a motor of 3½ in. diameter with 6 in. stroke, of the vertical or steam hammer type, you can coil a ⅝-in. copper pipe in about four coils, enclose it in a tin case, put a tin lamp inside it, using two ¾-in. wicks in your lamp, and a pint of oil will run the motor for 30 hours, giving you excellent effects for a small expenditure in fuel. The rise in temperature of the air entering the motor is quite perceptible, and if you are working the motor in a cold climate you will find it an advantage in getting rid of the formation of ice, because if you do use the air expansively to its full effect you are liable to choke your passages with ice or snow.

I would ask in using the pneumatic riveter for tank work if the members of this association found it a clear advantage? I have used such a riveter, and the increase in the time and labor given to caulking the tank, especially of the lower joint, joining the floor plate, was so much increased that there was no gain. I take it to be that the rapid action of the pneumatic riveter left the rivet too hot.

Mr. MITCHELL: We make our cisterns for tenders with pneumatic rivets; no caulking to the cisterns. The angle-iron runs around for the top and bottom. Against the angle-iron we put tar paper and the sheet against that, and then the pneumatic rivets. No caulking is done on the tender. We have followed the practice for years, and I see no necessity for caulking tenders. Our apprentice boys do the work.

Mr. GEO. GIBBS: I notice from the replies that the number of railroads which report using electricity was only two, and they only had nine motors. I confess to my shame that that we did not reply to the circular, so we are not included in the roads. I take exception to some of the statements of the committee as to the relative field for the use of electric motors. I should say that air, steam and water are suited to the field of pressure operations, and operations where blows are delivered, and that electricity is pre-eminently suited to the operation of producing rotary motion. I mean these for the details of operation. I do not say that a steam engine is not suitable for driving a shop—I mean for isolated tools or conducting operations in places where portability is an object. The rotary motion produced by air may be of advantage in some cases. Up to date I do not know of any electric devices developed practically for drilling and tapping staybolts where lightness is essential, and there seems to be no reason why they should not be developed. Probably the reason is that nobody connected with the electrical manufacturers has been familiar with the needs of railroad shops. I think an important department in the shop could be created if some man were to familiarize himself with the progress of electricity, and be able to report on the relative advantages of air and electricity when the question of the portable tool came up.

Subjects for the 1898 Convention.

1. Graphical charts for motive power records.
2. Tonnage ratings for locomotives.
3. Water purification and the use of boiler purgings.
4. The advantage of improved tools in railroad shops.
5. The use of oil furnaces and best form of burner.
6. The best form of fastening for locomotive cylinders.
7. Boiler and cylinder insulation.
8. The efficiency of high steam pressures for locomotives.
9. The economical handling of locomotive fuel.

The PRESIDENT: The convention has decided that there should be eight subjects. In addition to the nine subjects proposed by the committee, two others have been authorized by the convention: Bolts and nuts and dimensions of the head, to be treated conjointly with a committee of the M. C. B. Association and the continuation of the committee on the apprentice boy; also the continuation of the committee on the revision of air-brake and signal instructions. These three added to the nine will make a total of twelve.

Mr. HENDERSON: I move that the subjects be referred to the Executive Committee, with power to strike out four, according to their judgment. Carried.

The president appointed the following gentlemen as the Committee on Subjects to report at the Convention of 1898: Messrs. C. H. Quereau, W. H. Thomas, Philip Wallace.

Officers elected.

President, Pulaski Leeds.
First Vice-President, R. Quayle.
Second Vice-President, J. H. McConnell.
Third Vice-President, W. S. Morris.
Treasurer, J. N. Barr.

Topical Discussions.

No. 10 Research Laboratory under the control of the American Railway Master Mechanics' Association.

Professor GOSS: The first question which arises is, if we had a laboratory, what would be its work, and how would we do it, and it is to this question only that I will address myself. I assume that the facts which the mechanical department of a railroad requires may be grouped into two classes—first, those which are necessary for the conduct of routine work, such as tests of the strength of materials, lubricants, etc., and, second, facts which are to guide practice—that is, research facts. The laboratory, if one were to exist, would carry on the routine work in much the same way that existing laboratories on large roads carry on the work. We will assume that there is a central laboratory, started by some logical process to which all the roads would contribute. Roads having this routine work done would be expected to pay the cost to the laboratory, and small roads which now are unable to secure at any ordinary cost results of this sort would thus be able to command the facilities of a large establishment. It is not expected by me that the larger roads would abandon their present laboratories.

In matters of research, we should have contributions from all roads interested, valuable for carrying on a study, experimental or otherwise, of the larger problems which concern the interests of the roads in general. This work in detail could be carried out through committees of this association as at present, committees being chosen to investigate certain subjects. Instead, however, of taking the time of the chairmen of these committees, and taking the equipment of the roads upon which these chairmen happen to serve, thus making the contribution to the association the contribution of a few individuals and roads, these committees could at once appeal to the central laboratory sustained by all the roads, and through the force organized in the central laboratory, and the facilities brought into existence in the central laboratory, the required research could be made and the data reviewed by the committee and finally brought before the Association. It would place in the hands of the association an extra force and laboratory equipment which would be paid for by all the railroads receiving benefit, and not, as at present, by the few roads upon which the experiments may chance to be made.

Mr. QUEREAU: The most important reports adopted by this association were those prepared from laboratory tests. One of these is the report of the committee on steam passages and exhaust pipes. It is probable that the data gathered there and the laws laid down will stand for years. The results of the tests of the Committee on Brake-Shoes are valuable, and were made from laboratory tests. The railroad companies are appreciating the fact, in view of the growing practice of railroad companies to sustain laboratories; but, as was suggested by Professor Goss, it is hardly fair that one company should be put to the expense and labor of conducting these tests, and it would be better if each road could contribute a small quota to the general expense; all roads would be benefited, and the results would save the expense over and over again.

The Duties and Discretionary Powers of a Train Dispatcher.*

BY H. A. DALBY, N. Y., N. H & H. R. R., NEW HAVEN.

First of all he should know his road thoroughly. This knowledge comprises not only locations of stations and sidings, grades, bridges and tunnels; these, of course, are essential; but a thorough knowledge of the road includes curves, cuts, embankments, highway crossings, overhead crossings, under crossings, divisions of sections and location of section men, approximate length of passing sidings and whether it is hard or easy to enter or leave them, the view in each direction from every telegraph office, the particular grade immediately at all telegraph stations and whether it is a hard or an easy place to stop a heavy freight train, location of water tanks and where certain trains take water, the work of local freight trains and what part of station yards they occupy while doing their work, the manner and routine of changing engines or cutting off or putting on passenger cars if such is regularly done on the road, etc. He should know the local names of crossings, bridges, cuts, etc., and these are not hard to learn from trainmen, who are always willing to impart information as to the hard pull around "Devil's Elbow," or through "Mulligan's Cut." These views may not be shared by all, but the writer can say that every one of the above details has at some time or other been helpful in his experience.

A prominent New England road issued an order that dispatchers should ride over the division on a freight train at least once a month. One of the Pennsylvania lines in Indiana arranged that its dispatchers should, in turn, act as freight conductors at stated intervals.

The writer learned his first road almost entirely by night, from 6 to 11 p. m.; once every month, when the moon was full, riding 108 miles on the engine, to obtain the knowledge which it was impossible to acquire during the day.

In addition to the above, and scarcely less in importance, should be a personal knowledge of train and station men with whom he has to deal. He should not only know them personally, but cultivate their acquaintance and good will. He has a far better control over these men, and his orders will be more cheerfully and promptly carried out, if there is a personal knowledge of each other and an assurance on the part of the men that the dispatcher bears only good will toward them and is seeking *with* them to increase the efficiency of the service. He should encourage them at all times to report to him any unusual occurrence which may in any way endanger the interests of the company or affect the workings of the division, and should never refuse to listen to any information or suggestions coming from such sources. We are, none of us, too old to learn, and they may be possessed of knowledge which would be of value to us.

In short, we must obtain, so far as possible, a thorough knowledge of all things which may in any way increase our efficiency as dispatchers, not forgetting that our superior officers and the company that employs us are all entitled to the *best* there is in us. Their wishes and interests should be studied and consulted, and only by thinking of ourselves last can we render that faithful service which, by implication, we guarantee when we enter their employ.

The dispatcher is responsible, to some extent, for the figures on the balance sheet. Economy of operation, over-time of trainmen and operators, the amount of work performed, or time lost by work trains, rest in no small degree upon him. Shippers send their freight by the route that will transport it the quickest; that furnishes the most suitable cars.

The dispatcher has a moral responsibility. He occupies the position of middleman, standing between the management and a part of its employees. The man under him has certain rights as well as the man over him. As a rule it is poor judgment to administer a severe and hasty reprimand on the wire, many times doing an injustice to the offender, impairing the dignity of both

* Extracts from a paper read before the annual meeting of the Train Dispatchers' Association, Detroit, Mich., June 22.

parties, and often creating a dislike, which to say the least, is not beneficial to the service. Of course no member of this association was ever guilty of *profanity* on the wire. When a dispatcher considers how far a statement of his will go toward shaping the destiny of those under him, he must realize that he owes a duty to such, which he cannot be too careful to perform.

I have expressed myself on previous occasions in favor of orders containing but a single movement, except in cases where, in all probability, no part of the order will have to be changed. This is recommended by the Standard Code, as well as by high authority on the subject of dispatching. Long orders, containing several movements, aside from the possibility of having to change one or more portions, are subject to several objections. Operators are not all good writers and many of them do not know the first principles of punctuation, which might be a very important factor in a lengthy order. Some of us have seen orders copied in a large, bold hand until the sheet was nearly full, when the operator suddenly realized that he must economize space, and the last line or two needed a magnifying glass to decipher them. Another disadvantage is that a conductor or engineer cannot lay aside the parts that are "fulfilled, superseded or annulled," as he can with shorter documents. Some believe, when making a meeting point, in stating at all times which train shall take the siding; some make the provision only when contrary to general rules. For myself, considering that this part of the order is often read and acted upon by station men and others who are not familiar with train rules, I have considered it wise to insert this provision whenever it would seem that it would be of service and prevent any possible misunderstanding. I have always used it between passenger trains, and sometimes between freights; never considering these extra safeguards as burdensome or superfluous. Upon the road which I represent an order has been recently issued providing that *all* meeting orders shall specify which train shall take the siding.

I have many times informed operators of meeting points to be made at their stations; have told them of second sections, if such were unusual; that certain trains were annulled and were running as extras; that an extra might be expected about a certain time; and various items of a similar nature which might be of benefit to them and to me. It has been urged that this practice is detrimental, in that it encourages operators and trainmen to depend upon this source for *all* important information, rendering them careless to some extent in obtaining it for themselves; but the information can be imparted in such a way as to avoid any evil effects, and, to my mind, greatly assist in the operation of a division. If, perchance, a conductor or engineer is not satisfied as to the safety or clearness of an order, it is poor policy to argue the matter with him. It is far preferable to give such orders as are satisfactory, allow the train to move, and settle the difference of opinion at a more convenient season.

The use of non-telegraph stations as meeting or passing points is the cause of much evil. In many cases, especially when two or more movements are grouped at and near such a siding, the loss of time resulting from unexpected contingencies more than offsets the advantage gained.

Frequently it requires as much skill to know when *not* to give orders as to give them. In case of partial or total wire failure it is often best to allow trains to take their course upon their own rights than to attempt to help them. I have, during storms and other interference with the wires, allowed passenger trains to go to their regular meeting points, rather than run the risk of getting the order to the superior train and failing to get it to the inferior, which would result in holding each indefinitely.

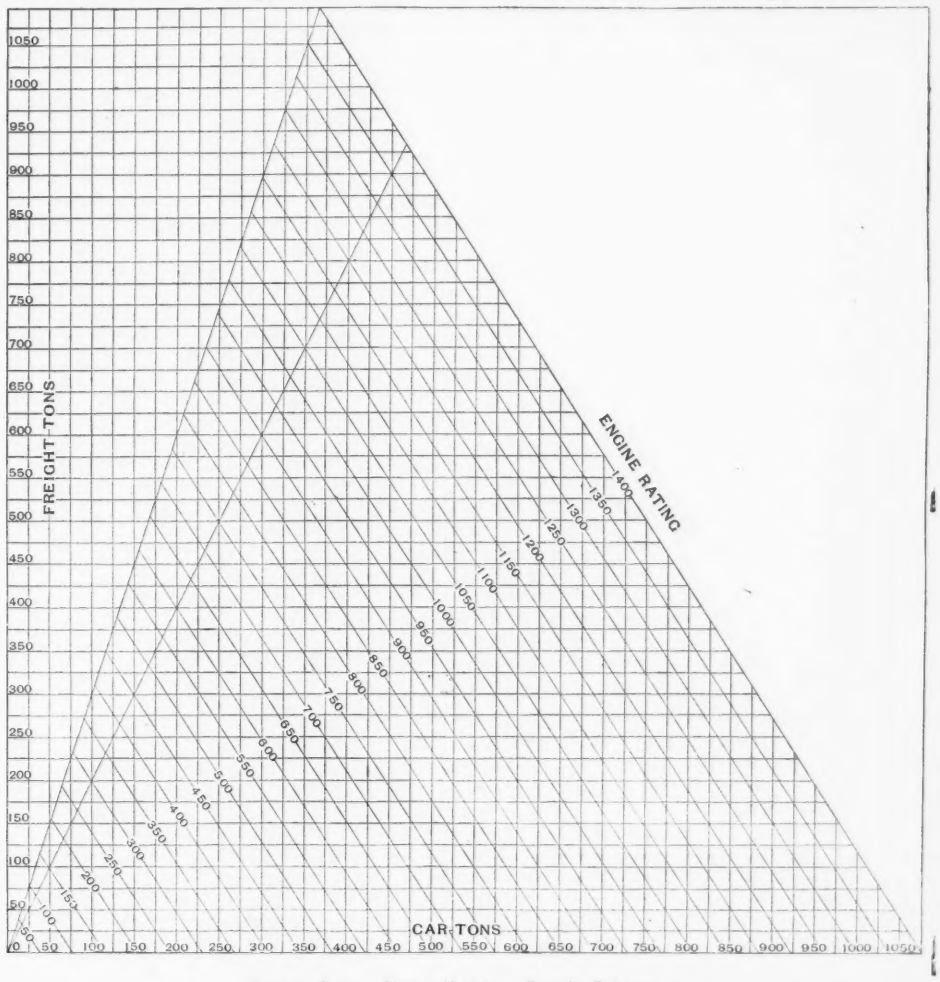
Such are some of the situations which confront a dispatcher. His duties are largely matters of guess-work and he who is the best guesser, as a rule, is the best dispatcher. How important, then, that we should cultivate good, sound, cool and unbiased judgment!

Engine Rating Chart of the Northern Pacific.

The diagram shows a chart designed by Mr. E. H. McHenry, Chief Engineer of the Northern Pacific Railway, and issued under date of April 24, 1897. For purpose of reproduction we have reduced the chart to about one-third of its original size, and in doing so have left out a good many of the lines. In the original sheet the spaces representing 50 tons are divided into 10. In our reproduction they are only divided by two, but even this would permit a pretty accurate result by estimation. Concerning this chart we have the following letter from Mr. McHenry:

"The difference in resistance per ton of loaded and empty cars has long been known, but up to date, to the best of my knowledge, no attempt has been made to provide for this, except that in some cases a distinction has been made between loads and empties. This, however, does not provide for any variation in the weight of the load, as anything from one ton to the full capacity of the car is technically a 'load,' and to obtain a practicable working rule, the ratio between the paying and non-paying tonnage should be taken into account. The average carrying capacity of all classes of freight equipment has been ascertained to be about two-thirds the weight of a fully loaded car, and the table has been computed on that basis accordingly. The difference in resistance per ton between fully loaded and empty cars has been ascertained by dynamometer experiments, and is also given in A. M. Wellington's work, 'The Economic Theory of Railway Location,' and in preparing the table, the resistance per ton of empties is assumed to be 30 per cent. greater than the weight of cars loaded to their full capacity. The engine tonnage ratings are accordingly virtual ratings for equivalent tons, to give the same resistance.

"During the short time the chart has been in use on the Northern Pacific Railway, the results have worked out exceedingly well in practice, although after a longer trial the sheet will doubtless be modified to suit the local conditions, and to accord with the experience on each division or engine district. Engine tonnage ratings are usually fixed by the average resistance over the district, which results in overloading the engine with some trains, and underloading in other cases. The use of the chart permits an engine to be loaded up to its full capacity in all cases, and results in considerably increasing the average engine rating. The resistance per ton of a fully loaded car is adopted as the unit, and the resistance of partially loaded cars or empties is equated. The method of using the sheet is given by the instructions and examples accompanying it, and it may be interesting to know that as each yard master is usually concerned with the ratings of but few different classes of engines, he will rapidly memorize ratings under different conditions of loading."



Engine Rating Chart—Northern Pacific Railway.

Instructions for Use.—Read tonnage rating on diagonal lines at intersection of horizontal line of freight tonnage with vertical line of car tonnage; if above or below the required rating subtract or add the necessary number of tons to make it correspond.

Examples.—The following tonnages all intersect on the same diagonal line and therefore all correspond to the same engine rating of 900 tons:

Freight tons.	Car tons.	Freight tons.	Car tons.
600	300	200	560
400	430	0	693

The yard master finds that he has 400 freight tons and 400 car tons in a train, which by the chart corresponds to an engine rating of 860 tons. If the required rating is 840 tons, he will drop 20 tons from the train, or if the rating should be 900 tons he will add 40 tons to the train.

Improved Suburban Service in Chicago.

Arrangements for passenger traffic have been completed between the Metropolitan Elevated and the new suburban electric lines in the vicinity of Fortieth street, Chicago. By this arrangement the suburban towns will secure a much improved service and the new conditions will afford an interesting study of competing electric and steam roads. While all the facts in connection with the changes cannot now be given, many interesting particulars which lead up to the final arrangement are available.

The Chicago & Northern Pacific was reorganized on May 20 last, and the new company, known as the Chicago Terminal & Transfer Railroad Co., was incorporated June 4, with a capital stock of $30,000,000. The charter provides not only for the right to operate the Chicago & Northern Pacific, but also for building a number of extensions to the present line and securing complete title to those roads that are now in operation. There are two branch roads, however, which, while included in this transfer, are worked by the Suburban Railroad Co. These are known as the Chicago, Harlem & Batavia and the Chicago & Southwestern railroads, both of which were leased about a year ago, and since then electricity has been adopted as a motive power. The present completed portion is ready to work between the Harlem racetrack, Austin, Ridgeland, Oak Park and other suburban towns and the city limits, making in all about 13 miles of track. The company expects, however, to have 27 miles of double track ready for service in time, and believes that a large part of the suburban traffic now handled by the steam roads will be taken by the electric line, inasmuch as frequent trains at fair speed will be run on the electric road.

The plan is to run the cars of the new suburban lines into the downtown portion of the city over the tracks of the Metropolitan Elevated from West Fortieth street. The overhead wire will be used on the surface line, and the cars are to be provided with shoes to take the current from the third rail on the elevated. The Suburban Railroad has erected a large generating station at Harlem avenue and Twenty-second street to supply power for the lines completed and to be built. This in itself will give an improved suburban service, as the cars will run into the heart of the city, and when the Union Elevated loop is completed, connections may be made with the Southside Elevated (known as the Alley L), similar to those which we learn have been completed between the Metropolitan Elevated and the Chicago Transfer and Railroad Co. For the particulars regarding the change of motive power on the Alley L, the reader is referred to the *Railroad Gazette* of March 26, 1897.

The Siberian Banana Belt.

The *Journal* of the German Railroad Union, in a long article on the topography of the Siberian Railroad, gives the following account of the climate on a section of it east of Lake Baikal.

The climate also hinders the execution of the work of construction. Throughout Transbaikalia, in spite of the continental climate and its severity, very sharp changes of temperature are observed. In the Jablonoj mountains it rises during the day as high as 77 deg. Fahr., to fall at night down to 23 deg. The air is very dry, the yearly rainfall slight; only little snow falls, so that on the whole division as far as the lower Selenga the ground is barely covered. Only there and on Lake Baikal is there sleighing for a short time; further east it is rare and only on the frozen rivers.

Meteorological observation has shown that in Verchneudinsk the average temperature in 1886 was above freezing only during three months (über ± 0.), in 1877 was above freezing in one month and just at the freezing point during two, and in 1881 only for two months was above freezing. In the period 1886-1888 the highest temperature was 98½ deg. in July; the lowest—53 deg. in January.

On the Vitimski plateau and in the Jablonoj mountains even in the summer a temperature of only 9 deg. below freezing (—5 deg. C.) prevailed. The earth, therefore, on the upper Uda, on the Vitimsk plateau, in the Jablonoj mountains and in the Konda and Chita valleys is frozen almost without exception. In the Chita valley, at a height of 2,380 ft. above the sea, the earth was found to be frozen to a depth of 24 ft. 6 in. on the average. In the summer it thaws out to a thickness of only 11 ft. 8 in. This stratum remains frozen eternally. On the Vitimsk plateau, on the other hand, and in the Jablonoj mountains the earth thaws only 3 ft. 6 in. and in Rondyna 4 ft. 2 in.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The state of New York is now ready to spend $100,000 yearly for the abolition of highway grade crossings (or will be, we suppose, on July 1, when the new law, reported in another column of this paper, goes into effect); and as the appropriation is predicated upon the expenditure, concurrently, of $300,000 by towns and railroad companies for the same object, we may assume, on a rough estimate, that 15 or 20 crossings will be done away with each year. This is by no means certain, however, for cities and towns may be reluctant to appropriate money for improvements of this kind even when the state relieves them of one-half of the burden which would normally fall upon them. It is to be remembered that the Massachusetts towns which have so generally taken advantage of the State appropriations in that State during the past seven years have been relieved of a much larger share of the expense. The State pays 25 per cent., as in New York, but puts 15 per cent. more upon the railroads, leaving only 10 per cent. to be paid by the towns. New York railroads will find their negotiations with towns considerably more difficult, no doubt. The length of railroads in New York is about 8,000 miles. If there are 8,000 crossings in the state (the average in Massachusetts and other states is about one to a mile) it will take, at the rate of 20 a year, 400 years to get them all out of the way. This is a sober estimate, which very likely will prove true, unless larger appropriations are made somewhere; and yet the newspapers all over the state are congratulating themselves and their readers as though the reform were almost accomplished already. Even Massachusetts, in seven years, has only been able to make a beginning, though the state appropriation there was *twenty times* as much per crossing per year as that of New York (Massachusetts has about 2,000 crossings, and appropriates $500,000 yearly).

The subject of grade crossings, the danger inseparable from them and the importance of abolishing them as soon as possible was brought to notice a few weeks ago by a distressing accident at Valley Stream, L. I., near New York City, and all the newspapers commented on it; but in almost every case the views expressed were of the same superficial nature as those concerning the new law which we have mentioned above. Editors call for an overhead bridge anywhere—or everywhere—as strenuously as though they were 8-year-old boys, with no knowledge of economy, instead of men holding positions as instructors of the public. Railroad officers are denounced as murderers when, as every one knows, it would be the public and not the railroads, which would suffer if all trains were compelled to reduce speed on approaching street crossings. For the present and for a long time to come reduction of speed is the only possible safeguard at the great majority of crossings, for the expense of attendants would be out of the question. At Valley Stream it is stated that only three trains a day pass over the crossing. If railroads had to maintain flagmen at such crossings as that they might as well give up trying to make their receipts equal their expenses. From the reports of the Valley Stream investigation we conclude that the coach driver was grossly careless, having no appreciation of his responsibility as the custodian of a large coach full of pleasure-seekers; but still the evidence shows that the railroad, or the town, might have made the crossing less dangerous by cutting down a few trees. It appears that not until a driver gets within 34 feet of the track can he see as far up the railroad as 1,200 feet. The statement from which we get this information says that the railroad right of way was suitably cleared.

Mr. Cole, the new Chairman of the New York State Railroad Commissioners, took occasion, in discussing the Valley Stream accident, to correct some of the misapprehensions of the newspapers. To a reporter of the New York *Sun* he said:

"The claim, so broadly made, that Engineer Calligan neither blew his whistle nor rang his bell before reaching the crossing is refuted by strong evidence. It is true that the survivors of the accident say that the proper signals were not given. They would perhaps state more exactly both the truth and their own meaning if they confined the statement to saying that they did not hear the signals. So far as the mechanical gong at the crossing is concerned, it was in good order and undoubtedly rang. The impression that this is a crossing at which the dangers are extraordinary arises from misinformation. It is not on the main line of the Long Island Railroad, and only three trains a day pass at this crossing. The greatest blame lies with the heedless and innocent party as they rollicked along the road, paying no attention whatever to anything but their own merrymaking, laughter, and hornblowing, which, probably, had at the moment diverted the attention of the driver himself from his duty. Such an accident as this one would not be likely to happen again in a hundred years, and there is good reason to hope and believe that within 10 or 15 years it will be rendered well-nigh impossible in this state through the enforcement of the new grade-crossing law. This law, however, had to be brought to the attention of many successive legislatures by the Railroad Commission, and failed at each session until the one just closed. Even then it had but five votes to spare in the Assembly, and was pulled through on the last day of the session only by the united efforts of railroad officials and the members of the Railroad Commission, who pleaded personally with the members for their votes. Many members told me personally that they were opposed to the bill because they feared that it was going to impose additional taxes on their towns or districts, and some of them knew so little about the scope of the bill that they believed it provided in substance for the immediate abolition at one fell swoop of all the grade crossings in the state."

Mr. Cole's estimate of the time necessary to make safe all the crossings in the state is exceedingly optimistic; but we may perhaps hope that he will be able to secure a larger appropriation from the state than that provided for by the law just passed.

In the matter of the reliability of the automatic audible signal at Valley Stream, Mr. Cole's statement, based, no doubt, on the best evidence at his command, is, unfortunately, somewhat neutralized by the testimony of a grocer who crosses the track frequently at that point, to the effect that the bell has often rung when no train was approaching. He asserted that it had been out of order for a week at a time. A bell managed in that way is about as bad as none at all, and in many cases may be worse than none No one has yet devised a practicable plan for making highway crossing bells give suitable and seasonable notice of their own failures, as do automatic block signals, and the only possible way to get satisfactory service out of them is to maintain the very highest quality of inspection and care. We know nothing concerning the material or workmanship of bells on the Long Island road, nor whether the failures reported by the grocer occurred six weeks ago, or six years; but the instance is a reminder to every superintendent who depends upon bells that his confidence rests on a shaky foundation unless material, workmanship, inspection and maintenance are of the very best. The average track foreman, making this a mere incident of his duties, may almost surely be set down in advance as a poor inspector. In a disaster similar to that at Valley Stream, reported from Denver, Col., on the same day, six children were killed. In this case the accident took place at 8 p. m. on a crossing which was watched in the day time, but not at night. Whether or not the wagon driver depended upon receiving a warning from an attendant does not appear, but the instance makes prominent one more essential feature of grade-crossing management, the necessity of making clear to wayfarers, in a case of this kind, whether the attendant is or is not on duty. This information, by a well-lighted sign, should obtrude itself upon the attention of every person approaching the crossing day or night.

So far but little has been published on the subject of long locomotive runs, and what is presented elsewhere in this issue is in the nature of a summary of the progress that has been made by a few representative railroads in different parts of the country. The subject is important and while the extension of locomotive runs will be a matter of experiment for each individual road at first, yet the proposition that it is economical to run engines long distances is already generally conceded. The main objects to be gained by making engine runs long are that the engines are kept more constantly in service, a smaller number is required to handle the same business and there is a considerable saving in the matter of boiler and firebox repairs while a still greater saving is affected in fuel and terminal expenses. The application of the long-run system to a road having a number of short divisions can be made in a manner similar to that of the Chesapeake & Ohio, where longer runs are made by doubling the several divisions; and the Cleveland, Cincinnati, Chicago & St. Louis is an example of a railroad to which long runs are particularly adapted and where all the benefits can be derived. The limited experience of this road goes to show that it is perfectly practicable to run engines hauling passenger and freight trains from 260 to 280 miles without stopping to clean the fires. The amount of fuel lost in cleaning fires is variously stated as being from 400 to 2,000 lbs., depending largely on the quality of the coal used, and how long the engines are held. The increase in engine mileage also varies on different roads, but it would be safe to say that where divisions are consolidated, making engine runs of 200 miles and over, a saving of 25 per cent. could be properly expected, and that this figure, if traffic was favorable, could be raised to 50 per cent. On most roads where the locomotive runs are extended the enginemen and firemen at first object to the change, but in a very short time they become accustomed to the new conditions and do not care to return to the short runs. Also, in the matter of abolishing terminal stations some roads have met with considerable opposition from towns, which, having been terminal points, object to being reduced to way stations, and retaliate by passing various annoying ordinances.

The Future of the Conventions.

What will the conventions of the Master Car Builders' Association and the Master Mechanics' Association develop into? Are they destined to become again quiet and laborious meetings of serious men for the study of important technical questions connected with the mechanics of railroad working; or will they grow into great fairs like that of Nijni-Novgorod, or like the ancient fairs of Mecca, to which buyers and sellers will go to make immediate transactions or to lay pipe for future business, and where the curious or those in need of diversion will gather for the sake of the entertainment and to which the learned will go only incidentally? Perhaps these are unnecessary questions, but they must have suggested themselves to the minds of a good many men who have seen the conventions of late years. The germs of the great fair are there now, and these meetings already attract many sellers, if not many buyers, and perhaps the buyers will come later. Indeed, purchasing agents are now to be seen at the conventions and probably superintendents of motive power and master car builders sometimes take there the first steps toward future business transactions. There are shows and diversions in plenty and those who are attracted by hopes of gain or of amusement are probably even more numerous than the working members of the conventions.

But in spite of the drift of the conventions toward development into great fairs for buying and selling and for amusement there are good reasons to suppose that they will not go much further in this direction, but will soon turn and drift back again toward the original plan of meetings for improvement of railroad practice. The fair has had an important influence on the growth of civilization. It has advanced knowledge, improved manners and spread trade, but the world has outgrown it. As a means of buying or selling goods or of interchange of opinion and intelligence it is too costly and cubersome for a civilized country with modern means of communication. Ease of transportation will exterminate it. This is probably a safe general proposition. There are reasons to think that it will apply to the case in hand.

Probably all the sales made at the conventions, or as a result of them, could be made cheaper in other ways. Perhaps one dollar invested in sending out salesmen, quietly and at favorable times, to visit possible buyers in business hours at their offices, will produce better results than five dollars spent at the conventions. This is a mere guess; the proportion may be more or less unfavorable, but the convention method is surely wasteful. This must be largely a matter of opinion, for it is impossible to estimate at all accurately the value of the personal acquaintance made in the social hours. It is quite obvious, how-

ever, that the effect on sales of money spent on flowers, carriages, boats, trolley-car fares, bands and other forms of entertainment and refreshment must be very indirect and speculative. It is a fair presumption that prudent business men will gradually realize (many of them realize it now) that the convention way of cultivating business is extravagant, and consequently we may suppose that the development of the commercial feature of these gatherings has about reached its climax.

Probably no one will claim that the development of these yearly meetings into great fairs with the trading attachment and the amusement addition has improved them as deliberative bodies. All the original purposes of the conventions could be carried out quicker, cheaper and better in a quieter atmosphere. This we may suppose will not be disputed; so here again is reason to think that there will be a reaction toward the old simple days when the fathers of the associations were slowly hewing their way toward good practice and uniform practice. Knowledge has grown in the last 25 years; the associations have grown; more topics are taken up; the average treatment of subjects reported on is higher, not in natural ability, but in range of knowledge and in method of analysis; but the questions remain much the same in kind, and standard practice and uniformity are almost as important subjects of debate as they ever were, notwithstanding the arduous and efficient work of the associations in the past. The history of the labors and achievements of these two associations and of the work of the German Railroad Union should be written together some day. It will make one of the most valuable chapters in the history of the development of transportation. But really their work is only begun. There still remains the need of close, thorough work and a great deal of it, and it is not likely that the character of the conventions will be allowed to change materially and permanently from what it has been in the past—meetings for the serious discussion of serious matters.

But, however correct these speculations may be, there are certain matters of which we can speak with a little more definiteness of opinion. One of these is the plan to have both conventions in one week. Mr. Soule, in his address as President of the Master Mechanics' Association, proposed this, and the convention directed the executive committee to arrange with the Master Car Builders for the details of the convention week. This action having been taken, it may be superfluous to discuss it further, and, indeed, it seems enough to call attention to it. The objections to having the conventions spread over two weeks are obvious, and have been pointed out in past years. Many men, many of the best men, are members of both associations. It is important that they should attend both conventions. But these are the very men who cannot be spared from their work for two weeks.

On the contrary, it is entirely possible to condense the work of the two into one week by holding two sessions a day with committee meetings in the evening. If necessary, indeed it would not be very burdensome to have an evening session for the presidents' addresses and other affairs of ceremony. This is the practice of the American Societies of Civil and Mechanical Engineers. In fact, two short sessions in one day would be better than one long one. An intermission would give a chance to rest and refresh the mind. The last half hour of a long session is tedious to most men. The attention wanders and action is often hasty from more fatigue.

We think we foresee one effect of considerable value to come from concentrating the whole work into one week; quite apart from saving time and money, it will make the commercial side of the conventions less important and will help to restore the entertainment feature to its proper proportions. The men who have helped to build up the associations, who have watched their growth, who are proud of their history and jealous of their dignity will welcome a return to the old simple ways when the "entertainments" were few and cheap, and when the members paid for their own pleasures.

The High Speed Brake.

Twenty years ago it was known to Mr. Westinghouse that the perfect brake must be capable of variable pressure—high at application and falling as the speed of the train falls, and we cannot say when the studies and experiments began which have resulted in the "high speed brake" now offered by the Westinghouse Company as a thoroughly developed, proved and practical mechanism. Indeed, it would be impossible for anyone but Mr. Westinghouse himself to trace accurately the chronology of development of any of the important features of the air brake as we see it now. It has been an organic development, and even the well-marked epochs with which all are familiar were, perhaps, in most cases only bringing to light, in working form, ideas which had been growing, more or less consciously and systematically, for a good while. We shall not try, therefore, to say when the high speed brake began.

Four years ago we wrote: "One of the most important of the probable improvements in air-brake practice, so far as can be foreseen now, is an arrangement by which the initial pressure on the brakeshoe will be increased, to be reduced as the speed declines. This is not only the next great step to be taken, but it is likely to be taken very soon; and yet it is not wholly certain that anybody has conquered its difficulties." Almost a year before that, in 1892 namely, the Westinghouse Company was making experiments at Altoona with a reinforced brake, and had found that stops from 60 miles an hour could be made in 70 or 75 per cent. of the distance required by the quick-acting automatic brake, not reinforced. When we wrote the words quoted above (1893), a variable-pressure brake was in use on the Empire State Express, carrying 100 pounds train-pipe pressure. This was the quick-acting brake, with a pressure-reducing valve, identical in operation, and practically so in all details, with the apparatus described on another page. The Pennsylvania trials of about the same period, or a little earlier, were with a big cylinder, thus getting greater brake pressure without increasing the train pipe pressure. The obvious advantage of this arrangement, if it had proved practicable, would have been that cars not fitted with the reinforced brake could be run in the same train.

Experiments were made later on the Pennsylvania with the same apparatus tried on the New York Central, and all these experiments gradually narrowed practice down to the high train-pipe pressure, the automatic relief valve and a special safety valve to be put on cars temporarily run in such trains.

The New York Central experience resulted in the adoption of the variable-pressure brake as standard practice for the Empire State express trains, more than three years ago, and it has been used there satisfactorily ever since. Somewhat later the same apparatus was applied to the Congressional Limited of the Pennsylvania and there also its operation has been thoroughly satisfactory.

Therefore, considering the long study and experiment, and the thorough and continuous experience in a very exacting service, the Westinghouse Air Brake Company is now fully justified in offering the high speed brake apparatus as a standard equipment for fast service.

It is hardly necessary to recapitulate here the advantages of the use, in fast service, of a variable brakeshoe pressure. They have been often stated in these columns in years past, and are summed up in the description of the apparatus on another page. The first and greatest is quicker stopping, with all that that means. Thirty per cent. of the distance can be saved by this special apparatus. Experiments on a 30.-ft. down grade, with emergency stops at 60 miles an hour, showed a saving of 450 ft. in the length of stop as compared with the ordinary quick action brake. This alone is a fact of tremendous importance.

Another item is the saving of flat wheels. It is said that not a slid-flat wheel has been reported from the Empire State Express cars since the new high-speed apparatus has been in use.

An incidental advantage which Mr. Buchanan has considered important, and which the enginemen appreciate, is that three full service applications can be made without recharging the auxiliary reservoir. The third application will still give a cylinder pressure of at least 50 lbs., the usual service pressure.

The Populist Railroads.

We chronicled recently the fact that the Arkansas Senate has passed a bill authorizing the building of a state railroad with convict labor, and now we learn that the bill has passed the lower house and been signed by the Governor. A board of commissioners is authorized to open subscription lists for funds or property to be given by the public, and when such gifts are "adjudged to be worth the sum of $100,000 in cash the board shall accept said donations and said subscriptions." This board is instructed to outline a north and south and an east and west line of railroad for the state.

Now another scheme of the same sort comes forward, being that of Governor Leedy, the populist governor of Kansas. He proposes to build a railroad from some point in central Nebraska, down through Kansas, Oklahoma, the Indian Territory and Texas to the Gulf. He professes to represent "a company of railroad men who wish to go into partnership with the public" in such an enterprise, and the proposition is that states and municipalities shall control the majority of the stock of the railroad, and the men associated with him will take in no outside capital except that of the states and municipalities. But the public "need not put up one cent until the railroad is built."

It is too bad that the Governor's scheme for financing the enterprise is not made public, further than that the stock and bonds will be issued through some of the State Railroad Commissioners. It is hardly probable that he and "the railroad men who wish to go into partnership with the public" have $10,000,000 in their pockets. If they had they would not be populists another minute. By the way, we arrive at this sum of $10,000,000 by assuming 1,000 miles at $10,000 a mile, which is a favorite populist figure for the cost of railroads. Of course $40,000,000 would be a good deal nearer than $10,000,000, even for a very cheap railroad, but we will let them have the road at department store prices. The Governor and his altruistic associates not having the cash, and the public not being allowed to put up a cent till the road is built, obviously the money kings, the plutocrats, the robber barons, in a word, those who have saved a little money, will be expected to buy the bonds, and probably those bonds will be guaranteed by the states and towns, and what more natural and just than that they should get even with the money power by repudiating interest and principal when the road is fairly built and working? Meanwhile the entire stock of the road will be held by the philanthropic promoters and the communities, and will not have cost them a cent. Surely, the populist can give Wall Street long odds and then win when it comes to watering stock.

Of course neither the Arkansas nor the Kansas scheme is new, and it is highly improbable that either one of them will ever be carried to actual building, and yet even this folly is possible. At any rate, it is no wonder that these schemes should have a revival, considering the wave of populism that has recently swept over the country. The only wonder is that Governor Leedy does not propose that his railroad should be worked by electricity on the "third rail system." We recommend this amendment to him and to the excitable reporter of the *New York Herald*, who is about to equip most of the railroads entering New York City on this "system," by which he claims that as much as "1 H. P. may be got out of two tons of coal." It may be that it will be necessary for one of these populist railroads to be built and to ruin a few Western cities and counties and to enrich a few "leaders of the people" before the people understand the enormous folly of such enterprises; but we still hope that the light of reason may be enough to avert such a misfortune.

The French Railroads in 1896.

The preliminary reports of the seven great railroad systems in France show that their business improved in 1896, as it had done in 1895 and 1894, and as traffic improved on the German and English railroads, in striking contrast to the course of things in a part of the world not so far off. The gross earnings of the French railroads were about $6,500,000, or 2.6 per cent. more in 1896 than in 1895, while their working expenses increased only $300,000, leaving a gain in net earnings of $6,200,000, or 5.3 per cent.

About one-third of the earnings were from passengers, and the rate of increase in this traffic was greater than in freight, though not more than in express freight. In each of the two previous years there had been an increase of about $6,000,000 in gross earnings, with some decrease in working expenses. The average earnings per mile of the French roads were about $10,850, and the working expenses absorbed but 51.6 per cent. of them, leaving $5,250 net earnings per mile, against $6,050 gross and $1,967 net in this country. The difference is easily accounted for when we remember that France has 1,547 inhabitants per mile of railroad and this country 385, aside from the difference in rates, which are given only for each system in the French report, ranging from 1.11 to 1.33 cents per passenger per mile, and from 1.24 to 1.666 cents per ton per mile, against 2.04 cents per passenger-mile and 0.839 cents per ton-mile here.

The French railroad companies, by their contracts with the state, are guaranteed certain minimum dividends. If they have received advances on this account, and thereafter are able to earn more than the guaranteed dividends, part of the excess goes toward reimbursing the state for its advances. One of the six great companies (the Northern) paid off all that had been advanced to it long ago, and now is able to divide all its profits. The other five required advances amounting to $19,400,000 in 1894 and $15,400,000 in 1895. Last year one of these, the Paris, Lyons & Mediterranean, had profits enough to pay the guaranteed dividends and pay back $1,143,000 to the state on account of advances theretofore, while

the other four companies and some secondary systems required advances amounting to $8,260,000, or a net advance of $7,117,000. There are, however, a number of local, colonial and Algerian railroads which last year required about $6,000,000 from the state.

The French system with the largest earnings per mile is the Northern, earning gross $17,050 last year, and just half that amount net. The state system has the lightest earnings per mile, $4,960, and its working expenses take 74 per cent. of that, leaving but $1,290 net. We may not jump to the conclusion that its inferiority is due to state management. As a fact, its state management is due to its inferiority, a number of bankrupt lines having been taken up and made into a system by the state when they were so worthless that no one wanted to have anything to do with them. The largest French system, the Paris, Lyons & Mediterranean, is worked for 45 per cent. of its gross earnings. It is the road with the highest average passenger rate.

The capital invested in the French railroads amounts to about $3,160,000,000, of which $900,000,000 has been expended by the state. The net earnings last year were at the rate of 3.95 per cent. on this whole capital.

A railroad general manager in New York City has made two separate pilgrimages to Philadelphia to see the Keeley motor, and on his last visit he is said to have taken with him the chief engineer of a very respectable traction company. Of course these gentlemen come back with the old, old story that has been repeated now for 22 years, that they saw something go, but do not know what made it go. We cannot imagine that either of these gentlemen is so ignorant of mechanics and of commerce as to suppose that there is any possible object in getting them to look into this fraud, except that of selling stock to an innocent public. A man in the position of either of these gentlemen, who lends his reputation to the purposes of the owners of Keeley motor stock, is committing an offense against common morals, and opening himself to suspicion.

Long Locomotive Runs.

At the March meeting of the Western Railway Club the question of the advantages of running locomotives long distances was discussed, and it was evident that several members present had carefully considered the question, and that many Western roads had already made considerable progress in this direction. The discussion was published in the *Railroad Gazette* of April 23, 1897. Since that time we have endeavored to obtain further information on this subject. Letters of inquiry were sent to a number of important roads, in response to which answers have been received, some giving very full accounts of what has been done toward lengthening locomotive runs and the saving that has followed.

All the replies received favor running locomotives long distances, although local conditions often prevent the practice, especially on the Eastern railroads. The through roads operating in the central states and those directly west of the Mississippi River have very generally increased the distances between engine terminals.

The Baltimore & Ohio is running passenger engines from 100 to 150 miles and the freight runs are of practically the same length as the passenger. While these can hardly be considered long runs, Mr Harvey Middleton, General Superintendent of Motive Power of the road, advises us that he is a believer in long runs for locomotives.

On the Delaware & Hudson the average runs made by freight engines are 140 miles and this is accomplished by doubling the divisions.

The Erie has lengthened its locomotive runs quite recently at two points, making the distances from Hornellsville, N. Y., to Meadville, Pa., 181 miles, and from Meadville to Galion, O., a distance of 184 miles, without changing engines. The Pennsylvania has also recently lengthened certain runs, but we have no definite information of the results of the changes on either of these roads.

On one division of the New York, Ontario & Western the engines hauling all classes of freight and passenger trains make 150 miles between terminals. While there has been no perceptible gain in the monthly engine mileage due to the increased locomotive run, yet on other roads with which Mr. West has been connected, the engine mileage was increased 50 per cent., by lengthening the runs a like amount. However, a decided saving was effected in the cost of maintaining flues when the engines were kept constantly in service, and no trouble was experienced in running 150 miles without cleaning the fires. While there is considerable saving by holding or banking the fires when bituminous coal is used, with anthracite coal there is no saving.

On the Chesapeake & Ohio it is considered that the present system of running locomotives is the best that can be devised on account of the topography of the lines and the present situation of terminal stations. It will be noticed from the following table giving the arrangement of the locomotive runs on this road, that the engines are run longer distances on short divisions by turning the engines and doubling over the road without cleaning the fires. It might well be noted that the coal and water used on this road are of the best.

The passenger engine runs have lately been increased on the Norfolk & Western, as follows: Engines now run through from Roanoke to Norfolk 258 miles, whereas they were formerly changed at Crewe, distant from Roanoke 128 miles. Also, engines were previously changed at Shenandoah in running from Roanoke to Hagerstown, while now one engine makes the whole distance of 240 miles between these points, the distance from Roanoke to Shenandoah being 132 miles. Engines are run through from Gray to Columbus, a distance of 264 miles, while formerly a change was made at Kenova, which is 125 miles from Gray. The engine crews are still changed at Crewe, Shenandoah and Kenova.

ARRANGEMENT OF LOCOMOTIVE RUNS- C. & O. RY.

Class of trains.	Terminal Stations.	Distance, miles.
	Peninsula Division.	
First	Richmond to Ft. Monroe and return	170
Second	Richmond to Newport News and return.	150
Local freight	Richmond to Newport News	75
	Richmond Division.	
	Piedmont District.	
First	Richmond to Charlottesville and return.	193
Second	" " " " "	193
Local freight	" " " "	97
	Mountain District. (Very mountainous, heavy grades.)	
First	Charlottesville to West Clifton Forge and return	192
Second	Charlottesville to West Clifton Forge and return	192
Local freight	Charlottesville to West Clifton Forge	96
	James River Division.	
	Rivanna District.	
First	Entire length of James River Div. and return, viz.: Richmond to Clifton Forge	232
Second	Richmond to Gladstone	119
Local freight	Richmond to Gladstone	119
	Alleghany District.	
Second	Gladstone to West Clifton Forge	113
Local freight	Gladstone to West Clifton Forge	113
	Washington Division.	
First	Charlottesville to Washington	115
	Huntington Division.	
First	Hinton to Huntington	147
	Greebrier District.	
Second	Clifton Forge to Hinton and return	159
Local freight	Clifton Forge to Hinton	80
	New River District.	
Second	Hinton to Handley and return.	145
Local freight	Hinton to Handley	72
	Kanawha District.	
Second	Handley to Russell	95
Local freight	Handley to Huntington.	74
	Cincinnati Division.	
First	Huntington to Cincinnati	161
Second	Russell to Cincinnati	141
Local freight	Russell to Garrison and return.	68
Local freight	Cincinnati to Garrison and return	102
	Lexington Division.	123
First	Ashland to Lexington	123
Second	Ashland to Lexington	90
Local freight	Ashland to Mt. Sterling	67
Local freight	Lexington to Mt. Sterling and return	
	Big Sandy Division.	
Second	Ashland to Peach Orchard and return	103

The above relates only to passenger engines, but the practicability of running freight engines through from Roanoke to Hagerstown is now being tested. We are advised by Mr. Soule that the experiments have not been continued long enough to judge whether the plan will be successful or whether this practice will be applied generally wherever opportunities offer. If the engine runs should be generally extended it would make the average freight run on this road about 250 miles. The freight trains which are now hauled by locomotives making these long runs between Roanoke and Hagerstown are of all kinds, including stock, poultry, dead freight, etc., but as they are mostly run as extras it is not possible to give the schedules; they are sent over the road in as good time as circumstances will permit. We quote the following from Mr. Soule's letter:

"The experiment has not been under way long enough for us to say what the gain in engine mileage will be, but we ought not to be at all surprised if the increase amounts to 25 per cent. The indications are that flues will give more trouble than formerly, but at the same time we do not like to pass final judgment on this question at present. We see no reason why the fireboxes (with the exception of the flues) should not stand up as well under one system as the other.

"At first we had trouble in keeping up steam toward the end of these long runs, but as the firemen and enginemen have become more familiar with the new circumstances and conditions they have quite rapidly adapted themselves to them, so that this trouble is experienced at this time in a very much less degree, and we anticipate that it will soon disappear entirely.

"We have the very best coal (Pocahontas), but a variety of waters. In general, those on the extreme east and extreme west end of our line are good soft waters, whereas those in our middle territory are hard limestone waters, causing much incrustation. We cannot say how much fuel will be saved by holding the fires, but firmly believe there is some saving of that sort to be enjoyed.

"By running our engines (both passenger and freight) through from Roanoke to Hagerstown we have practically closed down the shop at Shenandoah, and think likely that we are saving at Shenandoah something like $750 a month in labor only, with a corresponding saving in material."

Concerning the experience of the Lehigh Valley, we have the following from Mr. Higgins:

"On account of the great dissimilarity between the different divisions of this road, I will not attempt to explain what has been done on the entire system, in the direction of lengthening out the runs of the freight locomotives, but will answer the questions you propose for that proportion of the road which lies between Packerton and tidewater.

"We avoid one change of engines, which invariably resulted in a detention to the trains. We have reduced expenses about 20 per cent, which includes the time of the men, the fuel consumed and the care of the engines. We have increased the average mileage per engine, which means that we are doing the same amount of work with a less number of engines. The long runs are made by through freight trains, or what we call fast freights.

"The old schedue was Packerton to South Easton, 45 miles; South Easton to Jersey City, 77 miles; new schedule, Packerton to Jersey City, 122 miles.

"The gain in average mileage made per engine has been 21 per cent. There has been no appreciable difference in the maintenance of flues, fireboxes, etc. If the coal is good engines make the trip from Packerton to Jersey City without cleaning fires. If coal is bad fires have to be cleaned once. We have good water, but not always good coal."

On the roads in the Northwest very little has been done in lengthening locomotive runs. Nothing has been done on the Northern Pacific and no changes have been made lately on the Great Northern. On the latter road the passenger runs are from 150 to 200 miles and the freight engines make usually from 100 to 150 miles, depending wholly on the local conditions.

On the Chicago, Milwaukee & St. Paul the runs are arranged to suit the service and local conditions. In the past a number of changes have been made whereby two short divisions were merged into one and where such changes have been made the runs are now from 135 to 160 miles for both passenger and freight engines. It is not definitely decided what will be the policy of this road in the matter of long runs in the future.

The Chicago & Northwestern has on its Iowa Division freight engine runs as long as 200 miles, and the runs on this road are being gradually extended. The Chicago, Burlington & Quincy has on its main line reduced the number of terminal stations from eight to four, making the divisions 207, 100 and 180 miles in length. There is also on this road a passenger run from Rock Island to St. Louis of 242.5 miles which is made by one engine and two crews. This engine doubles the road every 24 hours, making 495 miles a day.

The Illinois Central, in fast passenger service, is running engines from Chicago to Centralia, 252 miles, where formerly engines were changed at Champaign, 128 miles from Chicago. This road also has passenger runs between Vicksburg and New Orleans of 235 miles, and at other points 135-mile divisions are doubled, making 270 miles continuous running.

About six years ago the Chicago, Rock Island & Pacific lengthened locomotive runs, and Mr. Wilson informs us that long runs are certainly to be preferred to short runs. The principal advantages which he has found are:

Time saved in changing engines, better mileage of engines, and a saving in fuel due to the less number of times the engines are fired up. A smaller number of engines is required to handle the same number of trains, and at intermediate terminals the expense of the roundhouse force, yard force and switch engines can be either entirely saved or greatly reduced, and on account of the fewer number of times the fires are cleaned, there is a reduction in the cost of maintaining flues, staybolts and fireboxes. The amount of fuel saved by holding the fire over, that used in rekindling, is from 500 to 800 lbs.; but whether it is economy to hold the fire depends upon the length of time the engine is held, and when the fire is dirty and full of clinkers it has been found to be economical to clean the grates.

On the West Iowa Division of the Chicago, Rock Island & Pacific, the engines hauling the passenger and through freight trains run 138 miles and the monthly engine mileage has been increased 19 per cent. on account of the longer runs. The locomotive runs on the Des Monies Valley Division are, for passenger and all freight trains, 181, 133 and 121 miles, and on this division the engine mileage has increased 8 per cent. for the passenger, and for the freight engines 15 per cent. Stuart has been abolished as a terminal station and Des Moines as a switch terminal, and it is estimated that this has resulted in a saving of $1,200 per month at the points named, while the increased expense at the present terminal, Valley Junction, is about $300 per month.

On the East Iowa Division both the passenger and all but the local freight runs have been lengthened from 107 miles to 182 miles. The monthly mileage made by the passenger engines is 1,200 miles and the freight engines make about 800 miles. On the passenger and fast freight runs the fires are not cleaned in going over the division, but on slow freights the fires have to be cleaned about every 100 miles. On this division the terminal at Brooklyn has been abolished, saving about $1,000 each month. The coal used on this road is a fair quality of bituminous coal, but most of the water is poor, containing a great deal of lime.

On the Atchison, Topeka & Santa Fe proper, the divisions were first located with a view of obtaining terminal stations from 10 to 150 miles apart. Many of the locomotive runs have been lengthened, cutting out a number of division points, so that there are now several runs from 150 to 200 miles long, on account of which the engine mileage has been increased 15 per cent. A similar plan is now under consideration to extend the locomotive runs on the Atlantic & Pacific and the Gulf, Colorado & Santa Fe, which will cut out two or three division points. We are advised that the management of the Atchison, Topeka & Santa Fe now have changes in view for the whole system which will save about $15,000 per year in

addition to the saving in fuel gained by the less number of times the engines are fired up.

On the Louisville & Nashville Railroad for many years they have made it a practice to run the engines as far as the condition of the road would permit, but on account of the location of the terminals and the length of the several divisions it is impracticable to further extend the runs. The distance from Cincinnati to Louisville is 110 miles, and, as the next division from Louisville to Bowling Greene is 114 miles, these two cannot be added together. At Bowling Green the business is divided, part going over the Clarksville Division, which is 134 miles, and part over the Second Division to Nashville, 72 miles, and while the engines hauling the fast freight trains are run through from Louisville to Nashville, most engines are turned at Bowling Green. Other engines run the 72 miles from Bowling Green to Nashville with a turn-around. The Clarksville Division and the Memphis line, 134 and 126 miles respectively, are continuous runs. All passenger trains are run without a change of engines from Louisville to Nashville, which is 187 miles, the passenger station being located one mile beyond the freight terminals All engines make a continuous run between Nashville and Decatur, 125 miles. On the South and North Division, 186 miles, so much of the business is received at Birmingham from the Birmingham Mineral Railroad that nearly all engines have to be turned at that point but the passenger trains all run through. On the Mobile & Montgomery Division, 180 miles, the passenger engines run through, but the freight trains mostly divide at Flomaton, and so the engines are turned at this point, making runs of 120 miles; engines with through freight trains are, however, run through the entire 180 miles. The Mobile & New Orleans Division, 149 miles long, is a continuous run for engines handling all classes of trains. On the Knoxville Branch the passenger engines run 201 miles, but as this is essentially a coal road most of the freight engines are run to accommodate the local business. Those hauling through freight trains run from Lebanon Junction to Corbin, 145 miles, and here the trains divide, those going over the Cumberland Valley Division being run with a single engine for the distance of 118 miles.

The Pennsylvania Lines West of Pittsburgh have several engine runs, hauling passenger and through freight trains, where between 170 and 200 miles are made without changing engines or crews.

This matter has been carefully investigated on the Cleveland, Cincinnati, Chicago & St. Louis, and the lines are particularly well located for such extensions. The long locomotive run system was put into effect during the past April on all the important divisions in both passenger and freight service. Mr. Garstang has furnished a very full account of the changes that have been made, from which our information is taken. The accompanying table gives a list of the former short runs and shows how the several divisions have been consolidated:

Table of Engine Distances.

Former, Short Run System.

From	To	Miles.
Cincinnati	Columbus	125
Columbus	Cleveland	138
Cincinnati	Indianapolis	111
Indianapolis	Kankakee	139
Cleveland	Bellefontaine	141
Bellefontaine	Indianapolis	142
St. Louis	Mattoon	137
Mattoon	Indianapolis	129
Louisville	Greensburg	84
Greensburg	Wabash	110

Present, Long Run System.

From	To	Miles.
Cincinnati	Cleveland	283
Cincinnati	Kankakee	250
Cleveland	Indianapolis	283
St. Louis	Indianapolis	266
Louisville	Wabash	194

These changes were made because it was found that a reduction of one-third the number of locomotives could be made and still the business could be handled. A like reduction would follow in the number of engine-houses to be maintained, and the cost of terminal expenses would be reduced practically 30 per cent. As the table shows five terminals would be abolished. It has been found to be advantageous to make all runs on this road between 250 and 300 miles in length, without stopping the engine for terminal attention. In both passenger and freight service the runs between St. Louis and Indianapolis, 266 miles, and between Indianapolis and Cleveland, 283 miles, are successfully made without cleaning the fires. There is no trouble in maintaining the steam pressure and making the schedule time on the latter ends of runs.

In this connection the following results of calorimeter tests of the coals and the analysis of the water mostly used are of interest:

Calorimeter Tests of Coals Used by C., C., C. & St. L. Ry.

Kind of coal.	Pounds of water evaporated per pound of coal.	Per cent. of ash.
Ohio	13.11	6.98
Indiana	12.68	4.20
Illinois	12.31	5.99
West Virginia	13.77	8.77

Analysis of Water—C., C., C. & St. L. Ry.

Parts per 100,000 gals. of Water.

Solids	43.20
Sulphuric anhydrid	5.97
Chlorine	1.1
Total hardness	12.7
Temporary hardness	5.4
Permanent hardness	7.3
Reaction	Alkaline.
Iron	None.

This water makes abundant strongly adherent scale, with little or no corrosion.

The increase in the engine mileage cannot be definitely determined as the long runs have not been in effect a sufficient length of time to make comparisons, but it is quite likely that the increased monthly mileage will be as much as 33 per cent, and it is expected that engines will make 20 per cent. more mileage between general repairs. It is already apparent that less trouble will be experienced in the future from flues, staybolts and fireboxes.

The locations of water and coaling stations on the C., C., C. & St. L. Ry. are well adapted to long runs, and it has not been necessary in making the change to go to any expense on this account. About the only objection that could be raised to the adoption of long engine runs on this road is that the principal shops are at the intermediate terminals, which are now practically abandoned so far as stopping engines is concerned. Thus it is necessary to cut the engines out of service at these points when shop repairs are required. This objection, however, has not proved serious or expensive. Mr. Garstang's conclusions are that although on his road the long-run system has been in effect but a short time, he is strongly of the opinion that this is the best and most economical way to handle locomotives, and he has had no cause to regret the adoption of the long runs.

TECHNICAL.

Manufacturing and Business.

R. Montfort, Chief Engineer of the Louisville & Nashville, Louisville, Ky., announces that the road will lease to responsible parties, for a term of years, the extensive works for creosoting timber with dead oil of coal tar, located on its line at West Pascagoula River, 44 miles west of Mobile, Ala.

At the annual meeting of the Barney & Smith Car Co, of Dayton, O., June 18, E. J. Barney was re-elected President, J. D. Platt, Vice-President and Treasurer; F. E Smith, Secretary, and A. M. Kittridge, Superintendent. The President reported a slow but substantial improvement in business prospects and anticipates that the works, which have been running with a reduced force on short time for more than a year, will soon resume with full force.

John V. Beekman, who for 30 years has been the Superintendent of the Lidgerwood Mfg. Co., 96 Liberty street, New York City, and who for the last two years has been in ill health, has returned and taken up his duties again, having entirely recovered.

The Williamson Bros. Co., of Philadelphia, Pa., has been incorporated with a capital stock of $150,000 to make all kinds of engines, machinery and boilers. The directors are: John D. Williamson, William C. Williamson, John D. Williamson, Jr. and H. W. Hand. A plant valued at $76,000 is included in the capital.

The works of the Buffalo Car Mfg. Co., at Buffalo, N. Y., which have been idle for several months past, have resumed operations.

Among recent orders of the Keystone Electric Co., of Erie, Pa., were two 185 H. P. generators for the Hampton, N. H., electric street railroad, two 55-H. P. machines for the Brown & Sharp Mfg. Co., Providence, R. I., and four motors for operating Jarecki pipe machines, for the Union Iron Works, of San Francisco, Cal.

The foreclosure sale of the property of the Madison Car Co., at Madison, Ill., which was to have taken place June 12, has been postponed indefinitely.

At the annual meeting of the New York Air Brake Co., 66 Broadway, New York City, June 17, the following Directors were elected: H. A. Rogers, Daniel Magone, Rowland Cox, George B. Massey, Crawford Livingston, I. B. Newcombe, C. A. Starbuck, J. C. Thompson and C. H. Chaffee. C. A. Starbuck was re-elected President and Daniel Magone Vice President, and J. C. Thompson, Secretary and Treasurer.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received a contract to furnish the steel work for and erect a new one-story 78 × 200 ft. boiler-house for the New York Steam Co., of New York City.

A company to be known as Fayette R. Plumb, Inc., of Philadelphia, has been incorporated to manufacture edge tools and tools for railroad and mining purposes. The capital stock is $350,000, which includes a plant of F. R. Plumb, valued at $315,000. The Directors are F. R. Plumb, President; Samuel Diston, John W. Grange, Charles E. Grange and Walter T. Bradley.

The McMyler Mfg. Co. of Cleveland, O., has received a contract to furnish the Pittsburgh & Conneaut Dock Co. with a plant for discharging iron ore from lake boats to ore cars of the Pittsburgh, Bessemer & Lake Erie Railroad. It will cost about $60,000.

Julian L. Yale & Co., dealers in railroad supplies, 1117 The Rookery, Chicago, have recently become agents for the Buckeye car coupler and Smith triple-expansion exhaust pipe for locomotives.

At the recent annual meeting of the Morse Twist Drill & Machine Co., of New Bedford, Mass., the former Board of Directors was re-elected as follows: Edward S. Taber, Andrew G. Pierce, Thomas M. Stetson, Frederick Grinnell and Gilbert Allen. Edward S. Taber was re-elected Treasurer and John Allen, Clerk.

Announcement has been made that after seven months of negotiation, the London reorganization committee of the United States Car Co., of Anniston, Ala., is prepared to carry out the plan of 1896, with some slight modifications. One modification provides that if default is made in payment of interest on the new first mortgage bonds, the principal is not to be declared due for three months, and then no action of the kind will be taken if three-quarters of the bonds represented at a special meeting called for the purpose so vote. This is considered to make the new bond practically an income.

One of the stockholders of the Eames Vacuum Brake Co of Watertown, N. Y., has given notice that application to the Supreme Court at Watertown will be made on June 26 for permission to begin an action for the dissolution of the company on the ground that it has not performed its corporate functions for a year past. The company was incorporated in 1876, and its capital stock is $500,000.

Iron and Steel.

The demand for iron and steel shows a decided improvement with an inclination toward an advance in prices. A number of Pennsylvania valley furnaces are being prepared for blast within two weeks. The Bessemer pig-iron market, however, continues quiet. The price of bar iron shows a slight increase.

The Elmira (N. Y.) Iron & Steel Rolling Mill has been placed in the hands of N. D. Doxey, the principal stockholder, as Receiver. The company, which was organized in January, 1896, makes a specialty of railroad iron.

No. 3 furnace of the Pennsylvania Steel Co., at Steelton, Pa., has been blown in. The three furnaces of this company are now in blast.

The Birmingham Rolling Mill Co., Birmingham, Ala., has given a contract for an additional 35-ton basic open-hearth furnace, to be built at once. The brick will be furnished by the Fayette Mfg. Co., of Pittsburgh, Pa.

Soho furnace, at Pittsburgh, Pa., which is owned by the New York Life Insurance Co., and heretofore operated by the Moorhead, McCleane Co., has been leased to W. P. Snyder & Co., who propose blowing it in before July 1.

No. 4 furnace of the Carnegie Steel Co., at Duquesne, Pa., was blown in on June 19. All of the company's four furnaces at Duquesne are now in blast.

It is expected that the improvements now being made to the plant of the Burgess Iron & Steel Co., at Portsmouth, O., will be completed and the plant ready for operation by Aug. 1. A new blooming mill from the Frank-Kneeland Machine Co., of Pittsburgh, and new engines from William Tod & Co., Youngstown, O., have been put in position. The soaking pits have been finished and the foundation is being built for the new 35-ton basic open-hearth furnace.

The steel plant of the Wheeling Iron & Steel Co., at Benwood, W. Va., was closed on June 19, on account of trouble with the wage scale.

The Cambria Rail Mill, at Johnstown, Pa., which has been closed for several months owing to lack of orders, resumed on June 21, employing 150 men.

New Stations and Shops.

The Grand Rapids & Indiana has given a contract to Hauser, Hayden & Owen to build a new freight station at Grand Rapids, Mich. The building will be of brick and stone, 400 × 51 ft. and one story high, and cost $26 000.

Plans for a new passenger station at Des Moines, Ia., have been prepared by the Des Moines Union. The building will be 80 × 320 ft., of rock-faced paving brick combined with pressed brick, with terra-cotta trimmings, and two stories high, the upper floor to be used for offices of the roads using the Des Moines Union tracks. The cost will be about $30,000. The work of remodeling the company's yards at Des Moines is nearly finished.

Work was begun on June 17 by the Norfolk & Western on a new roundhouse and terminal buildings at Kenova, W. Va. The roundhouse will accommodate 32 engines.

Compressed Air Motors for Mine Hauling.

Messrs. H. K. Porter & Co. have in hand the following pneumatic haulage plants for mine service:

The Mount Carbon Company, Limited, Powellton, W. Va., consisting of compressor, pipe lines, charging stations, etc., together with one 8-in. × 14-in. Class "B" (four driver) pneumatic locomotive, designed for making round trips from the foot of the slope to the ends of the several entries and return.

One 10½-in. × 14-in. Class "C" (six-wheel-connected), motor for the Cross Creek Coal Company, Drifton, Pa. This motor is provided with large storage and designed for heavy service.

One 8-in. × 14-in. Class "C" (six-wheel-connected) motor for the Carbon Coal Company, Greensburg, Pa.

Two 7-in. × 14-in. Class "B" (four-wheel-connected) motors for the Mill Creek Coal Company, New Boston, Pa. The storage reservoirs on all these motors are designed to carry 700 lbs. pressure per square inch, with the exception of the one for Cross Creek Coal Company, which is designed for 650 lbs. pressure.

In almost every case these orders were secured in competition with estimates and bids for electric haulage.

Axle Tests.

We have seen a table giving the results of physical tests on 25 steel axles made by the Illinois Steel Co. The axles were 4¾ in. in diameter at the middle and 7 ft. ¼ in. long. The drop tests were made by a weight of 1,640 lbs. falling 29 ft., bearings 3 ft. centers. The first blow produced deflections varying from 4¾ in. to 6½ in., the average being 5.36 in.: second blow from 6 in. to 7½ in., the average being 6 84 in.; the third blow bent them from 5¼ in. to 7⅛ in., with an average of 6.13 in.: the fourth blow from 5⅞ in. to 7½ in., with an average of

6.47 in., and the fifth from 5 in. to 6¾ in., average, 6.16 in. Tests made on pieces 2 in. long and ⅝ in. in diameter show a tensile strength ranging between 82,790 and 66,980 lbs. per square inch, the average being 71,038 lbs., with reductions of area varying from 22.5 to 42.24 per cent., the average being 29.52 per cent., and elongations from 19 to 30 per cent., with an average of 24.8 per cent.

Pressed Steel Brake Shoe Key.

The M. C. B. pressed steel brake shoe key, formerly manufactured by the Drexel Company, but now by the Q & C Co, has been improved, being strengthened at the point subjected to severest strain, as shown in the cut. With this improvement an objection to the pressed steel key has been removed, and while this key is now lighter than the forged key it is strong and elastic, being made of a fine grade of pressed steel. Beyond this improvement the makers have reduced the price, so that these keys are cheaper than many inferior keys.

Charcoal for Kindling.

Mr. G. W. West has recently written to us concerning the use of charcoal for kindling locomotives as follows: "We have been using charcoal for starting locomotive fires for two years, and would not go back to using wood at the same cost. The advantages of charcoal are: Less cost; it does not require one-tenth of the space for covering a month's supply; we can start a locomotive from the engine-house or terminal as soon as a sufficient quantity of steam is raised to move the engine. With wood fire, especially with hard coal, it is necessary that all the wood be allowed to burn away, or the exhaust will turn the wood over on top of the coal, allowing the green coal to fall on the grates, and it is impossible for an engine to steam. We estimate we are starting our fires for about one half the amount it cost us when using wood."

Laboratory for Testing Materials of Construction.

A circular letter from the British Iron & Steel Institute calls attention to what is being done in the equipment of the new laboratory for testing materials of construction to be located at the Federal Polytechnic School, Berlin. In 1895, at a congress held at Zurich, the International Society for the Unification of the Methods of Testing Materials of Construction was formed for the purpose of bringing together and classifying the work which is now being done by individual chemists in different countries. To aid in this, the chemical laboratory of the Federal Polytechnic School has been secured and Hanns von Jüptmer has been placed at the head of the experimental work. Attention is called to the needs of the laboratory and a request is made to those interested in the work in various countries to contribute something in order to carry on the proposed work. For this purpose $10,000 a year is required, and it will be impossible to undertake the work unless the payment of this amount is guaranteed for at least 10 years. The firm of Krupp, of Essen, has subscribed $250 a year for this purpose, while the Austrian iron masters have promised $1,750 a year. Those desiring to aid in the work should communicate with Mr. Bennett H. Brough, Secretary, Iron & Steel Institute, 28 Victoria street, London, S. W., England.

Railroad Material for Japan.

Some of the private railroads of Japan are in the market for a considerable quantity of shop machinery and tools. Inquiries have lately been sent out for estimates on three complete sets of automatic feed portable drills, six duplex lever punching machines, two hydraulic screw punching machines, three sets of double end punching and shearing machines and one plate planer.

The Armor Plate Compromise.

It is reported from Washington that the controversy between the government and the manufacturers over the price of armor plate for the new battleships Illinois, Alabama and Wisconsin will probably be settled by the acceptance of the compromise price of $425 per ton, recently recommended by Secretary Long. The price of $300 per ton, recommended by the Senate Naval Committee of the last Congress, was rejected by the Bethlehem and Carnegie companies, as was also the price of $400 per ton, afterward recommended by Secretaries Herbert and Long. The Naval Committee has finally agreed to $425 per ton, and the provision carrying the necessary authority and appropriation has been incorporated in the General Deficiency bill by the sub-committee of the Senate Appropriation Committee. The three battleships in question are nearly ready for their armor, and delays at this point would subject the government to heavy expense for penalties.

THE SCRAP HEAP.

Notes.

The *Atlanta Journal* reports that Brown's discipline has been adopted on the Southern Railway, the new regulations applying to enginemen, firemen, trainmen and yardmen.

The Atchison, Topeka & Santa Fe recently found that the payrolls were being padded at one of the large stations, and the discovery is likely to lead to several decapitations before the investigation is completed. A pay car was sent out the other day for the first time in three years.

At BO tower, near Altoona, the Pennsylvania Railroad now has in experimental use a three-position semaphore in which the caution indication is made by inclining the arm 45 deg. upward from the horizontal position. The lever in the interlocking machine is operated in the same way, and through the same arc of a circle, as in ordinary practice with two-position signals; but pulling the lever in the ordinary way gives the caution indication, while to indicate all-clear the operator must first depress a treadle, fixed near the lever, which actuates a selector.

The state of Texas has won two lawsuits by which the Galveston, Harrisburgh & San Antonio and the Houston & Texas Central will have to pay to the state large sums of money on account of debts that were supposed to have been settled away back in war time Money was lent to the railroads out of the state school fund and the railroads repaid the loan in installments: some of these were made during the Civil War, in the shape of state treasury warrants, and this is claimed by the railroads to have been a valid payment, but the warrants have been declared invalid, and the Court now decides that the debt of the railroads to the state has not been paid. The sums demanded in the several suits begun by the state aggregate $720,000.

The new fast freight train put on by the Union Pacific since the beginning of the sharp competition between that road and the Denver & Rio Grande, is making great time, and, according to local papers, it runs so fast on the down grades west of Sherman that the wheels only touch the track at high places. On one day recently a distance of 515 miles was traversed at the rate of 32 miles an hour, and on another day the whole trip from Council Bluffs to Ogden, 1,035 miles, was made at the rate of nearly 31 miles an hour, stops included in both cases. The new competition between the rival lines seems to be most intense in the latitude of Salt Lake City, and one of the incidents last reported is a story in the *Salt Lake Tribune* to the effect that a band of desperadoes had gone to Wyoming and camped out near the line of the Union Pacific, with the intention of robbing a passenger train. The Union Pacific people indignantly deny the report and say that they have not placed armed guards on passenger trains, as was alleged in the story.

Soon after the opening of the Tennessee Centennial Exhibition at Nashville, the authorities of that city passed an ordinance raising the price of ticket brokers' licenses to $1,000 a year, this action having been necessary in order to induce the railroads to sell round-trip tickets to the exhibition with a liberal time limit. The scalpers, however, appealed to the courts and easily got the law declared unconstitutional; and, soon after, it was reported that they were doing a thriving business, and would demoralize passenger rates throughout the term of the exhibition. But the City Council has tackled the matter a second time, and now has prescribed regulations which are of such reasonable nature that we should think they would hold water; and if the railroads keep a good lookout to see the ordinance is enforced it ought to prevent many irregularities. The license fee is fixed at $75 a year, but with every ticket sold the broker must give a certificate, stating the date upon which the ticket was sold, the starting point and the destination of the ticket, and the amount paid for it, and it shall be signed by the broker or some one in his office. The signing may be done by stamp. Failure to give the certificate or to make it out properly will be punishable by a fine of $50. Another provision is that if any broker sells a railroad ticket or contract for transportation which proves worthless to the purchaser, he shall be subject to a fine of $50. An applicant for a license must give a bond of $2,000.

A Proposed Peruvian Railroad.

With the object of favoring the building of a railroad from Lima, Peru, southeast to Pisco, on the coast, a distance of about 150 miles, the government of Peru has decided to grant exemption of duties on the material for its construction for a period of 20 years. A grant of 25,000 hectares (61,775 acres) of land will also be made. All taxes will be remitted and the right is granted to appropriate the land necessary for the road. If the road goes through, branches will probably be built from Lima west to Callao on the coast and from Pisco east to the Inca Valley.

University of Illinois.

Among the appropriations for the University of Illinois made by the legislature at the session just concluded, was one for $80,000 for a central heating plant from which all the buildings on the campus will be supplied with steam heat. It is expected that the new plant will be ready for operation by the opening of the fall term. The plans have been prepared under the direction of Prof. L. P. Breckenridge, head of the department of Mechanical Engineering. The Natural History Building of the University was struck by lightening June 17 and seriously damaged by the resulting fire. It is estimated that the damage from fire and water will amount to about $40,000.

Nicaragua Canal Bonds.

The stockholders of the Maritime Canal Company, of Nicaragua, have voted to issue five per cent. gold bonds for $150,000,000, payable July 1, 1996. The officers of the company were authorized, as security for the bonds to execute to Judge Henry E. Howland and Mr. Jacob W. Miller, as Trustees, a mortgage upon all the company's property, rights and franchises, including its franchise to be a corporation.

Proposed Electric Railroad in Ghent.

The franchise for an electric railroad in Ghent will soon be sold to the highest bidder at a fixed annual rental to be paid to the city for a certain term of years, at the expiration of which the city reserves the privilege of purchasing the entire plant. It is proposed to use storage battery cars in the central portion of the city, and to have overhead electric wires in the outlaying districts. Fare for first-class passengers will be three cents; second class two cents. The employees will work from 13½ to 14½ hours a day, and the wages for motormen, conductors and workmen are fixed at 72⅛, 69¼ and 58 cents a day respectively.

A Correspondence School for Railroad Employees.

The first lessons of the "Railway Correspondence School" have recently appeared. They make a 5 × 8 in. pamphlet of 32 pages, and are of an elementary character. The subjects treated are a general course for locomotive engineers, air-brake practice, mechanical drawing, electricity as a motive power, English grammar, writing, spelling, and pronunciation and practical arithmetic. Each lesson is followed by questions, which are to be answered, the answers to be mailed to the school. The plan of the school is to make the character of its instruction such that the effect will be to give engineers and firemen a better knowledge of their duties, besides giving them information on the general subjects named. At present the instruction is limited to courses for engineers and firemen. The school is carried on at 1 Madison avenue, New York City, where further information may be had by addressing "The Railway Correspondence School."

Rensselaer Polytechnic Institute.

The commencement exercises of the Rensselaer Polytechnic Institute were held the evening of June 16, being the seventy-first commencement of the institution. The Macdonald prize went to Mr. Henry B. Voorhees, of Philadelphia. Mr. George S Morison made the stated address of the evening, taking for his subject. "The Education of Engineers." We shall attempt no abstract of the address in this issue.

Pennsylvania Cabs in New York.

The Pennsylvania Railroad has established in connection with its new Twenty-third Street Ferry, New York, an admirable cab service. Hansoms will carry two persons a mile and a half for 25 cents, with 15 cents for each additional mile. For four-wheelers the rate is 40 cents for two persons, 10 cents for each additional one or two persons and 20 cents for each additional mile. Omnibuses are furnished at a minimum charge of $1 for four persons, or less, and 10 cents for each additional person. Valises are carried for five cents, chargeable only when carried on top by the driver, and trunks are carried on the cabs for 10 cents. In brief, the rates are about what they are in London. The cabs are clean and new and well horsed, the drivers are civil and there is a man at the ferry house to see that the passengers are promptly and properly provided for. The whole arrangement is a distinct advance in civilization, and is better than anything of the sort that we have seen before in New York.

Elevators for the Brooklyn Bridge.

The Trustees of the Brooklyn Bridge have decided to advertise for bids for the building of two elevators to accommodate passengers from the leather district in this city. They will be placed in the neighborhood of Gold and Frankfort streets, and are to handle 2,500 persons an hour.

For a Sea Wall at Sandy Hook.

The Secretary of War having recommended that a sea wall be built at Sandy Hook to protect the ordnance proving ground, a bill was introduced June 21, authorizing the immediate expenditure of $75,000 for the same.

The Proposed Arkansas State Railroad.

The Arkansas Legislature has passed, and the Governor has signed, the bill providing for the construction of railroads by convict labor, which was noted in the *Railroad Gazette* of May 28, page 379. The official title is "An Act to create a State Board authorized to locate, establish, survey, build, equip and operate State railroads and telegraphs; to provide the manner for raising revenue for such purpose. . . . The Governor, Auditor and Attorney-General are constituted a State Board with power to locate, survey, establish, build, equip and operate state railroads and telegraph lines. The said Board shall be authorized to receive donations and gifts of lands and money, and shall have full power to sell any lands belonging to the state within 12 miles of the track of any railroad so built. The Board is empowered to use convicts of the state.

Immediately after the passage of this act, it shall be the duty of said Board to open subscription books for the donation of lands and money, and to advertise the same. When in the judgment of the Board a sufficient sum has been raised to justify the commencement of work, they shall outline the road proposed to be built. . . . The state shall not be liable for any debt created by said Board. After the first 10 miles of any line of railroad have been graded, the State Board shall have the right to issue bonds and secure them by a first mortgage. . . . But the state shall assume no personal liability for such bonds.

French Machinery for the Panama Canal.

In a letter dated Panama, April 21, Consul-General Vifquain, after referring to the success of some American machinery bought by the Panama Canal Co., and the failure of some French machinery of the same kind, writes: "I have just been informed that an order has been issued by the Panama Canal directorship in Paris that everything used for work on the canal must be of French manufacture or product. Nearly every mail brings me catalogues or letters from American manufacturers, and I have made it a point to send them at once to the canal office here, where they are always welcome. Hereafter our manufacturers may as well save postage."

Removal of Duty on Windmills in Venezuela.

The government's foreign reports state on authority of the *Venezuelan Herald*, that after a third reading by Congress, in its session of May 18, a change in the custom-house duties affecting windmills was accorded. With the motive of encouraging agriculture and irrigation, windmills will enter all the ports of the Republic free of duty after June 1

A Veterans' Association.

A number of the employees of the Cleveland & Pittsburgh road, who have been in the company's service for 26 years or more, have formed a Veteran Employees' Association. The President is Mr. John Shimmin, and other prominent members are Samuel Johns, John Joyce, Uriah Venning, B F. Shrieves, Norman Chantney, Frank Robison, and W. B. Neal. Anyone is eligible who was connected with the road between 1851 and 1871 and some who are now retired have joined.

The I. O. R. C.

At New Haven, Conn., last Sunday, the Independent Order of Railway Conductors held a memorial service for deceased members. The meeting was held in the Church of the Redeemer. There were addresses by the Rev. Dr. W. L. Phillips, and by the President of the association, Mr. Frank A. Hermance.

English Excursion Train Wrecked.

A press despatch from London, June 12, says that an excursion train, while on its way from Barmouth to Oldham, was thrown from the track at Welshampton, near Oswestry, at midnight. Nine persons were killed and 25 injured.

Switch Operated by the Motorman from the Car.

Mr. Marcel Tremblay, of Springfield, Mass., is the inventor and patentee of an apparatus, now in experimental use on a number of street cars in Meriden, Conn., by which the motorman can set a switch, by touching a metal rod with his foot, without leaving his place on the platform. To set the apparatus for different switches—that is, to fix it so as to guide the car in the desired direction, whether to the right or the left, or straight ahead—the motorman moves an indicator on a dial which is fixed within his reach, near the controllor. The switch-setting apparatus is essentially a wedge, to be pushed downward into the flangeway.

The Physics of the Weed Burner.

We find in the Kansas papers the following notes on the Hancock weed burner, invented by Mr. George A. Hancock, Assistant Superinteedent of Machinery of the Santa Fe: "Mr. Avery Turner, Assistant Genera. Superintendent, said: 'We find that the new weed burner can be operated at one-half what it would cost to cut weeds, and unlike the cutting process, it effectually kills the plants. The heat produced is terrific and kills the weeds by instantly turning the sap into steam and exploding the plant at the roots. Between 25 and 30 miles of road can be burned in a day.'"

"Division Superintendent J. Barnes and others were testing a new weed burner last Saturday and Sunday. The machine is built on a flat car and has a furnace under the car which consumes crude petroleum from a tank above. The blaze is forced down and all weeds are destroyed under the car. It is estimated that the cost of killing weeds in this manner is but 90 cents per mile. When in operation the burner is moved over the road a little slower than an ordinary walk and it worked night and day."

Lake Superior Iron Ore Notes.

The sales of iron ore by Lake Superior mines, almost entirely by those of Minnesota and the Gogebic Range, in the past ten days have been about 2,000,000 tons, making total sales for the year to date, or since May 1st, when the old pool expired, about 7,500,000 tons. This is about three-fourths the total shipments and more than the total sales of last year. Very important sales are expected in the coming two weeks. All the large lake vessels are engaged in ore traffic, and at rates that pay them something, though they constantly complain. The largest sale of the week has been that of 500,000 tons of ore from the Biwabik mine in Minnesota at $2.25 a ton, and following it are sales of several hundred thousand tons by the Norrie of the Gogebic, and 225,000 by the Pioneer of the Vermillion. The Minnesota Iron Co. has sold in all something over 2,000,000 tons, and is working about 2,200 men in getting it out.

The iron ore roads are carrying very large amounts of freight at present, the Duluth, Missabe & Northern leading with about 18,000 tons a day, the Duluth & Iron Range following with 16,000, the Northwestern carrying to Escanaba some 10,000 tons, two roads carrying to Ashland about 15,000, and two carrying to Marquette nearly 18,000 tons.

A steam shovel at the Mountain Iron mine, north of Duluth, loaded from the ore bed 5,500 tons in 10 hours, on day shift last week, and 4,500 tons in night shift. These amounts break the records for the work of one shovel.

Making Whistle Signals Heard.

The investigation of the catastrophe at Valley Stream, on Long Island, in which a picnic wagon and its occupants were crushed by a locomotive, brings out much apparently inconsistent testimony. One of the most important points of inquiry is whether or no an electric bell signalled the approach of a train at the road crossing. . . . Questions as to the testimony of an engineer that he rang the bell and blew the whistle at a particular point on his route are somewhat different. Assuming the testimony to be honestly given, we must bear in mind the psychological principle that action regularly repeated tends to become automatic, and that automatic action leaves little trace in the memory. A singular incident that took place on the Central Vermont some time ago shows how many conditions require to be observed in determining the existence of a very simple fact with scientific accuracy. One of the division superintendents of that road received repeated complaints that at a certain crossing the prescribed signals from the locomotive were omitted. The engineers all protested that they had never neglected their duty. Finally the Superintendent determined to get his own evidence, and privily stationing himself in a suitable position, he saw a locomotive approach and pass without whistling or ringing the bell. On that locomotive, however, there happened to be one of the railroad detectives, who had made up his mind to look into the matter for himself, and who actually blew the whistle and rang the bell with his own hands. When the Superintendent returned to write the discharge of the guilty engineer, he was confronted with the evidence of the detective. To end the matter, they both went to the spot and found that from a certain point they could see the puff of steam at the whistle and the bell in motion, but heard no sound from either. An expert was called in who recommended the removal of a piece of forest, which being done, the signals became audible at the crossing. Professor Henry long ago showed that sounds may be heard by a person at a distance when they are inaudible to one nearer, and it is evidently necessary for railroad officers to ascertain not only that signals are properly given, but that they are actually audible where they should be.—*New York Evening Post.*

A Western African Railroad.

The railroad in the Portuguese colony of Angola, in Western Africa, has been completed from Loanda, on the coast, east 225.5 miles, to Ambaca-Lucalla. Since 1894 161.5 miles have been opened. Steel rails are used which weigh 20 kg. to the meter (about 40 lbs. to the yard). The tires are of fir, chemically treated, which prevents the ravages of ants. It is reported that the average cost of building the line, including the interest on the money invested, was 111,110 francs per kilometer (about $34,530 per mile). The road was built by native labor under the supervision of a corps of European engineers, mostly French; there were in 1890 about 3,000 men employed on the work. The locomotives used weigh about 25 tons and the average train speed is about 20 km. (12.42 miles) an hour. Where it formerly took 10 to 12 days to go from Loanda to Ambaca-Lucalla the time is now about 23 hours.

LOCOMOTIVE BUILDING.

The Galveston, Houston & Henderson is in the market for two locomotives.

The Baldwin Locomotive Works have received an order from the Texas & Pacific for six 10-wheel locomotives with 19 × 24 in. cylinders.

The Erie road has sent 15 more eight-wheel passenger locomotives to the Baldwin Locomotive Works to be changed from simple to compound.

The Baldwin Locomotive Works have received an order to build 12 more engines for Japan. This is in addition to the 18 mentioned in our last issue.

Specifications are expected in this country by early mail or by cable, for a number of locomotives for Japan. The number required will probably be not less than 25.

The Baldwin Locomotive Works are building one consolidation locomotive for the Oahu Railroad & Land Co., of Hawaii. This is in addition to the one mentioned in our issue of May 21.

The Atlanta Lumber Mills, of Atlanta, Tex., are in the market for one 30-ton standard-gage locomotive, probably for use on the Texas, Arkansas & Louisiana Railroad, referred to in our railroad construction column.

The Schenectady Locomotive Works, of Schenectady, N. Y., have received an order for 12 passenger locomotives for the Kiushiu Railway Co., of Japan. The general design is of the American type with 16 × 24 in. cylinders and 56-in. driving wheels. The tenders will have six wheels, the general design being similar to that used on the railroads of England. The locomotives are to be built for 3 ft. 6 in. tracks, the standard gage of the railroads of Japan. When finished each locomotive will be tested under steam on a temporary track at the works, and after inspection will be taken apart and packed for loading on steamship at New York.

In our last issue we noted an order for 15 locomotives given by the Baltimore & Ohio to the Pittsburgh Locomotive Works. These will be simple engines of the consolidation type, with 21 × 26 in. cylinders, 50 in. drivers, boilers 60 in. at waist, with an extended wagon top 8 in. high. The crown sheet will be supported by crown bars; working pressure, 180 lbs; the firebox will be located on top of frames, with inside dimensions 42 × 116 in.; the boilers will have 214 tubes 2¼ in. dia., 14 ft. 2½ in. long, spaced ¾ in. apart: heating surface, on tubes, 1,790.76 sq. ft., in firebox, 173.73 sq. ft., total, 1,964.49 sq. ft. The engines will have a rigid wheel base of 15 ft. 2 in., and a total wheel base of 23 ft. 2 in. The total weight will be about 145,000 lbs., and the weight on drivers 131,000 lbs.

CAR BUILDING.

The Mobile & Ohio has placed an order with the Pullman Palace Car Co. for 400 freight cars.

The Barney & Smith Car Co., of Dayton, O., has received an order to build 10 vestibule, 5 baggage and 5 mail and express cars for the Mobile & Ohio.

The Missouri Car & Foundry Co., St. Louis, Mo., is building 29 refrigerator cars for the St. Louis Refrigerator Co.

The Pullman Palace Car Co. recently received an order to build one passenger car for the Des Moines & Kansas City.

The Haskell & Barker Car Co., of Michigan City, Ind., is building 50 freight cars for the Chicago, St. Paul, Minneapolis & Omaha.

Rhodes, Curry & Co., of Amherst, N. S., have recently built for the Coast Railway of Nova Scotia five flat, two express and two box cars. The flat cars are of 40,000 lbs. capacity with Standard wheels and axles and Trojan couplers. The two box cars are also of 40,000 lbs. capacity, and equipped with Trojan couplers, Westinghouse air brakes and Standard wheels and axles. The express cars are of similar size to to the 40,000 lbs. capacity box cars, but have end platforms and end doors and four windows in each side and sliding doors. These are equipped with passenger car trucks, Westinghouse air-brakes and have Globe ventilators. These are to be used in connection with regular trains in handling express business, and particularly live lobsters and fresh fish, large quantities of which are shipped from points on the line to the Boston and New York markets in season.

BRIDGE BUILDING.

Akron, O.—The city is considering the building of a viaduct over the railroad at Mill street.

Baltimore, Md.—The Baltimore & Ohio, it is said, will build 10 new steel bridges. W. T. Manning, Chief Engineer.

Brainard, Minn.—Bids are asked July 12 for a new iron bridge across the Mississippi River at this point.

Buckingham, Va.—Bids are asked until July 5 for an 80-ft. iron or steel wagon bridge over Slate River, near Arvonia. William Peile, Engineer of Roads.

Dayton, Ky.—Plans and specifications for a proposed bridge at this place will soon be prepared. E. Shinkle, City Engineer.

DeKalb, Ill.—Bids are asked July 8 for a steel bridge with stone abutments. E. A. Porter, City Clerk.

Dixie, Ont.—A new steel bridge will be built over the river Credit on Dundas street at Springfield-on-Credit. Tenders will be called for in a few weeks by William Cook, Clerk of Township of Toronto.

Franklin, Pa.—Proposals will be received until July 2 for an iron bridge over Pithole Creek, in Cornplanter Township. It will be a county bridge of one span, 51 ft. 3 in. long, with a 12-ft. roadway.

Hillsboro, N. Dak.—It is stated that bids are wanted July 7 for three steel bridges for the county.

London, Ont.—The Middlesex County Council has decided to build a new bridge at Kilworth, at a cost of $6,000.

Monroe, La.—Bids are asked until July 10 for a bridge over the Ouachita River, estimated cost $50,000. Plans and specifications are in charge of the Mayor.

Montpelier, Vt.—The city has voted in favor of issuing $17,000 in bonds to build a bridge between here and Berlin.

Mt. Vernon, O.—It is stated that bids are asked July 7 for a bridge over the Mohican River, at Butler Ford. V. A. Wander, County Auditor.

Newport, Ark.—A bill has been introduced in the United States Senate to authorize the White & Black River Valley to build a bridge across the Black River. The bridge is to have a draw span and must be begun within one and finished within three years.

New York.—The contract for the foundations for the Brooklyn tower of the new East River bridge has been awarded to Colin McLean, 1 Broadway.

Rock Hill, S. C.—The Chairman of the Board of County Commissioners will receive bids for an iron and steel bridge across the Catawba River in Fort Mill Township. It is to have a roadway, a sidewalk and stone abutments.

St. Paul, Minn.—The contract for the superstructure of the Raymond avenue bridge has been given to the Universal Construction Co., Chicago, at $26,490.

Trenton, O.—The Cincinnati & Miami Traction Co. will build a new iron bridge across the river at this place.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Beech Creek, quarterly, 1 per cent., on guaranteed stock, payable July 1.

Canada Southern, 1 per cent., payable Aug. 2.

Des Moines & Fort Dodge, 6 per cent. on preferred stock, payable Aug. 20.

Fitchburg, 2 per cent. on preferred stock, payable July 15.

Lake Shore & Michigan Southern, 3 per cent., payable Aug. 2.

Michigan Central, 2 per cent., payable Aug. 2.

New London Northern, quarterly, 2¼ per cent., pay able July 2.

New York Central & Hudson River, quarterly, 1 per cent., payable July 15.

New York, New Haven & Hartford, quarterly, 2 per cent., payable June 30.

Norfolk & Southern, quarterly, 1 per cent., payable July 10.

Northern Central, 3 per cent., payable July 15.

Pittsburgh & Western, 4 per cent., payable July 1.

Oregon Railroad & Navigation Co., 1 per cent. on preferred stock, payable July 1.

St. Louis & San Francisco, 2 per cent. on first preferred stock, payable July 6.

Southwestern (Ga.), 5 per cent., payable July 6.

Baltimore City Passenger, 5 per cent., payable July 1.

United Traction & Electric (Providence, R. I.), 1½ per cent., payable July 6.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Montana Central, annual, Helena, Montana, July 26.

New Orleans & Southern, annual, New Orleans, La., July 13.

Southern Pacific of Arizona, annual, cor. Post and Montgomery streets, San Francisco, Cal., July 14.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Railroad Superintendents* will hold its next meeting at Nashville, Tenn., beginning Sept. 22.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19–22, 1897.

Engineers' Society of Western Pennsylvania.

The regular meeting of the Engineers' Society of Western Pennsylvania was held in the lecture-room of the society's house, 410 Penn avenue, Pittsburgh, on Tuesday evening, June 15. The paper of the evening, entitled "Steel Roofs of Mill Buildings," was read by Mr. A. E. Duckham. There was considerable discussion and some interesting points were brought out. Arrangements were made by the reception committee for the annual summer excursion.

Western Foundrymen's Association.

The annual meeting of the Western Foundrymen's Association was held May 19 at the Great Northern Hotel, Chicago. The attendance was larger than at any previous meeting during the year. The President, Mr. A. W. McArthur, read a short report of the work of the past year, and the Secretary's report showed that many practical questions had been discussed. The following officers were elected for the ensuing year: President, C. A. Sercomb; Vice-President, William Ferguson; Secretary, A. Sorge, Jr.; Treasurer, O. T. Stantial. Directors, G. H. Carver, J. M. Sweeney, A. W. McArthur, W. N. Moore and S. T. Johnston; Editing Committee, B. M. Gardner, Henry W. Carter and E. E. Hanna. After the election, a stereopticon lecture was given describing the arrangement and operation of the foundrie of Sulzer Brothers, at Wintherthur, Switzerland.

Iron and Steel Institute (British).

The autumn meeting of the Iron and Steel Institutes will be held at Cardiff Aug. 3 to 6. The meetings on Aug. 3 and 4 will be held at the House of the South Wales Institute of Engineers. The programme will embrace visits on Aug. 3 to the Bute Docks, the Cardiff-Dowlais Works and to other works in the vicinity. On Aug. 4 Penarth docks and other works on the Taff Vale Railway will be visited, and on Aug. 5 a visit will be made to the Dowlais and Cyfarthfa Steel Works. On Tuesday evening, Aug. 3, there will be a reception at the Free Library, Art Gallery and Museum Building. On Wednesday, Aug. 4, the members and ladies accompanying them will be invited to a ball by the Marquess of Bute, K. T., and the Marchioness of Bute. On Thursday, Aug. 5, the members and ladies accompanying them will be invited by the Local Committee to a Welsh concert at the Park Hall. The members will be invited to luncheon by the Monmouthshire and South Wales Coalowners' Association on Aug. 3, and on Aug. 4 by the President of the Cardiff Chamber of Commerce, the Right Honorable the Lord Windsor. On Aug. 4 they will also be invited to dinner by the directors of the Taff Vale Railway Company. On Friday, Aug. 6, there will be a whole day excursion for ladies and gentlemen to points of interest in the neighborhood.

American Society of Civil Engineers.

The twenty-ninth annual convention of the society will be held at the Chateau Frontenac, Quebec, Canada, beginning at 10 o'clock on Wednesday, June 30, 1897, and continuing through Thursday and Friday, July 1 and 2.

The local committees appointed by the Canadian Society of Civil Engineers are: In Montreal: Messrs. P. Alexander Peterson, John Kennedy, Ernest Marceau, Geo. Herrick Duggan, Percival W. St. George, W. McLea Walbank.

In Quebec: Messrs. St. George Boswell, Thomas Breen, G. F. Baillargé, E. A. Hoare, A. Rhodes, Ulric Valquet, Louis Vallée, O. Sterling, Edward A. Evans, C. E. Gauvin.

During the convention meetings for the reading and discussion of professional papers will be held, and it is also expected that informal addresses will be given by

several engineers residing in Canada on local engineering works of interest.

Three papers will be presented as follows: "The Relation of Tensile Strength to Composition in Structural Steel," by A. C. Cunningham, M. Am. Soc. C. E.; "Recent Tests of Bridge Members," by J. E. Greiner, M. Am. Soc. C. E.: "The Power Plant, Pipe Line and Dam of the Pioneer Electric Power Company at Ogden, Utah," by Henry Goldmark, M. Am. Soc. C. E.

A special train, on which transportation will be free, has been offered by the Canadian Pacific from Montreal to Quebec. This train is expected to leave Montreal at about 2 p. m. on Tuesday, June 29, and to arrive in Quebec in time for dinner. There will also be a special train from New York to Montreal. This train will leave the Grand Central Station at 9 a. m., June 28, over the New York Central & Hudson River, via Utica and Malone (Adirondack) branch. A dining car will be attached, and it is expected that Montreal will be reached at 9:30 p. m

Arrangements are being made by the members in Boston and vicinity to go directly to Montreal, leaving Boston Monday evening and arriving in Montreal early Tuesday and joining the main party on the special train to Quebec that afternoon. It is proposed that this party shall return to Boston by way of the White Mountains, giving those so desiring an opportunity to spend Sunday at one of the mountain resorts. S. E. Tinkham, M. Am. Soc. C. E., City Hall, Boston, is Secretary of the Committee arranging for this trip, and he will be glad to answer any inquiries in regard to it.

It has also been suggested, and quite a number have already stated their desire to go that way, that a party be formed at Niagara Falls, and go from there in a body. W. C. Johnson and R. S. Buck, Members Am. Soc. C. E., Niagara Falls, N. Y., are arranging for this trip, and have issued a circular giving certain information, some of which we reproduce:

The Niagara Falls Hydraulic Power & Manufacturing Company has four water wheels and eight generators are now in operation. An extension to this central station is now being constructed and this new work is at such a stage that the general plan and the conditions of the site can readily be seen. Work is also in progress on an enlargement of the canal. Rock is being excavated under water.

The Niagara Power Company has its transmission line to Buffalo now in operation and is transmitting current at 11,000 volts: it is also furnishing current to street railroads and other customers using direct current so that rotary transformers and transformers for raising the current to a high voltage can be seen in operation. This company is also engaged in enlarging its power station. The excavation is now nearly completed and the head works are in. The work is now at the stage which is most interesting to an engineer.

The new steel arch bridge at the time of the meeting will be completed, and the work of putting in the floor systems in progress. This work will be done without stopping traffic on either floor. It has been arranged to leave the International Hotel at 10 o'clock a. m., June 28, visit first the power-house of the Niagara Falls Hydraulic Power & Manufacturing Company. Later special electric cars will be taken to the power-house of the Niagara Power Company. After lunch the party will proceed by special electric cars to the new steel arch bridge. A train will be taken on the Grand Trunk at 6:15 for Montreal.

PERSONAL.

—Mr. Robert F. Kelly has been appointed General Agent of the Wabash at Buffalo, N. Y.

—Mr. Jacob Scholle, a director of the Brooklyn Elevated Railroad, died at Orange, N. J., on June 16.

—Mr. Julian Griggs, formerly Assistant Engineer of the Scioto Valley, has been appointed City Engineer of Columbus, O.

—Mr. E. E. Wood has been appointed Traveling Freight Agent for the Southern Railway, with headquarters at Boston, Mass.

—Mr. J. W. Midgley, Chairman of the Western Joint Traffic Bureau, has returned to Chicago after a three months' trip to Europe.

—Mr. George F. McCurdy has been appointed Traveling Freight Agent of the Chicago, Rock Island & Pacific for the New England states.

—Col. J. B. Burt has been appointed Superintendent of the Ravenswood, Spencer & Glenville, with headquarters at Ravenswood, W. Va.

—Mr. L. J. Quinn has been appointed Supervisor of the Columbus, Hocking Valley & Toledo, with headquarters at Logan, O., to succeed Mr. T. J. Shannon, deceased.

—Mr. W. F. Heisler has been appointed Trainmaster and Chief Train Dispatcher of the New Orleans Division of the Texas & Pacific, with headquarters at New Orleans, La.

—Mr. M. J. Roche has been appointed Northwestern Passenger Agent for the Rio Grande Western, with headquarters at Portland, Or. The appointment took effect June 15.

—Mr. H. L. Redfield has been appointed Assistant General Freight Agent of the Texas & Pacific, with headquarters at Dallas, Tex., to succeed Mr. G. H. Turner, resigned.

—Mr. H. D. Milton has been appointed General Agent of the Denver, Leadville & Gunnison, with headquarters at Leadville, Col. He will have charge of both freight and passenger business.

—Mr. L. D. Voak has been appointed Superintendent of the American Refrigerator Transit Co., to succeed Mr. W. W. Buffom, recently appointed Division Superintendent of the company.

—Mr. Wilson D. Cramer, Trainmaster of the Pennsylvania, with headquarters at Mifflin, Pa., died at his home at that place on June 16 after a long illness. Mr. Cramer was 67 years old.

—Mr. James Gass has been appointed New York State Passenger Agent of the Wabash, with headquarters at Buffalo, N. Y., to succeed Mr. R. F. Kelly, recently appointed General Agent of the company at that place.

—Mr. A. L. Roby, formerly Commercial Agent of the Southern Pacific, with headquarters at the City of Mexico, has been appointed Commercial Agent of the Mexican National, with headquarters at New Orleans.

—Mr. A. E. Marteny has been appointed Acting Superintendent of the St. Joseph Terminal Co., at St. Joseph, Mo., to succeed Mr. J. W. Starr, Superintendent, who has resigned to enter the service of the Atchison, Topeka & Santa Fe.

—Prof. George F. Swain, of the Massachusetts Institute of Technology, Bridge Engineer to the Railroad Commissioners of Massachusetts and member of the Boston Transit Commission, will sail for Europe early next month to be gone all summer.

—Mr. A. W. Dunning, Auditor of the Columbus, Sandusky & Hocking, has resigned. Mr. Dunning has been connected with the company since November, 1895. He is an expert accountant and was at one time Auditor of the Cleveland, Akron & Columbus.

—Mr. Charles L. Cormier, heretofore Assistant Traveling Auditor of the New York Central & Hudson River, has been appointed Traveling Auditor to succeed Mr. Lincoln Van Cott, who recently resigned to go to the Brooklyn Heights electric railroad.

—Mr. T. C. Rady, formerly Chief Train Dispatcher of the Texas & Pacific, at Marshall, Tex., has been appointed Division Superintendent of the International & Great Northern, with headquarters at Palestine, Tex., to succeed Mr. J. C. Gregory, resigned.

—Mr. A. R. Atkinson has been appointed Traveling Freight Agent for the Houston & Texas Central, with headquarters at Dallas, Tex., to succeed Mr. P. A. Miller, resigned. Mr. Atkinson has been for several years connected with the general freight office of the company.

—Mr. C. J. Larimer, formerly Chief Train Dispatcher of the Texas & Pacific, at Fort Worth, Tex., has been appointed General Live Stock Agent for the company, with headquarters at Fort Worth, to succeed Mr. Page Harris, who has been appointed Chief Clerk in the General Manager's office.

—Mr. Lewis S. Palfrey has been appointed Traveling Freight Agent of the Houston & Texas Central, with headquarters at Houston, Tex. Mr. Palfrey was formerly Chief Clerk in the Traffic Manager's office of the same company and will be succeeded in that position by Mr. F. A. Leovy.

—Mr. E. J. Coyle, heretofore General Agent for the Canadian Pacific at Portland, Or. has been appointed District Passenger Agent of the company, with headquarters at Vancouver, B. C., to succeed Mr. George McL. Brown. Mr. Coyle will be succeeded at Portland by Mr. B. W. Greer.

—Mr. T. C. Kimber, heretofore Traveling Passenger Agent of the Missouri Pacific, has been appointed District Passenger Agent for the company, with headquarters at Indianapolis, Ind., to succeed Mr. Coke Alexander, resigned to enter the service of the Louisville, Henderson & St. Louis.

—Mr. F. E. Ellis has been appointed General Agent for the Oregon Short Line, with headquarters at Portland, Or. Mr. Ellis has been in the employ of the Oregon Railway & Navigation Co. (now the Oregon Railroad & Navigation Co.) for the last 10 years, having lately been in charge of all traffic matters on Puget Sound.

ELECTIONS AND APPOINTMENTS.

Atlantic Avenue Improvement Commission.—The following officers of the Commission have recently been elected: President, Eugene G. Blackford; Vice-President, W. E. Phillips; Secretary, Edward F. Linton.

Baltimore & Ohio.—Edward B. Ashley has been appointed Principal Assistant Engineer of Maintenance of Way of the Lines East of the Ohio River, with headquarters at Mt. Royal Station, Baltimore. C. T. Manning has been appointed Division Engineer of Maintenance of Way, with headquarters at Pittsburgh. G. L. Hall has been appointed Division Engineer of Maintenance of Way, with headquarters at Grafton, W. Va.

Burlington & Northwestern.—At the recent annual meeting of stockholders, held at Burlington, Ia., the following officers and directors were elected: President, F. W. Barhydt; Vice-President, J. T. Remey; Secretary and Treasurer, R. M. Green; Directors, T. W. Barhydt, J. T. Remey, W. W. Baldwin, W. F. McFarland, J. W. Blythe, Lyman Cook, C. P. Squires, G. P. Garrett and H. B. Scott.

Burlington & Western.—At the annual meeting of stockholders, held recently at Burlington, Ia., the following officers and directors were elected: President, T. W. Barhydt; Vice-President, C. P. Squires; Secretary and Treasurer, R. M. Green; Directors, T. W. Barhydt, C. P. Squires, Lyman Cook, J. W. Blythe and H. B. Scott.

Chicago, Burlington & Northern.—At the annual meeting of stockholders, held recently at LaCrosse, Ind., the present Board of Directors was re-elected for the ensuing year.

George's Creek & Cumberland.—At the annual meeting of stockholders, held recently at Cumberland, Md., Directors for the ensuing year were re-elected as follows: Sidney Wintringham, Frank T. Robinson, John E. Knapp, James A. Alexander, Alexander M. White, James A. Millholland and W. DeL. Walbridge.

Iowa Central.—The offices of General Roadmaster and Master of Bridges and Buildings, held respectively by P. J. McNamara and M. M. Garvey, have been abolished and the duties of those offices will hereafter be performed by Chief Engineer C. W. McMeekin. E. E. Kerwin has been appointed General Trainmaster and B. G. Fallis Train Dispatcher.

Kinzua & Tiona.—G. W. Campbell, Kane, Pa., has been elected President and H. A. Jamison, Warren, Pa., Vice-President of this new company, which proposes building a railroad in Warren County. These two, with the following, compose the Board of Directors: J. W. Campbell, E. W. Campbell, E. D. Baker and A. P. Henry.

Mexican Land, Navigation & Railway Co.—At a recent meeting of the Board of Directors of this new company, in Mexico, officers were elected as follows: President, Pedro G. Mendez; Treasurer, H. P. Sturt; Secretary, Carlos de Landa y Escandon; Representative and Legal Adviser, Emilio Velasco.

Rome & Clinton.—At the annual meeting of stockholders, held recently at Rome, N. Y., officers were elected as follows: President, James I. Scollard; Vice-President, W. H. Tuller; Secretary and Treasurer, C. D. Hayes.

Santa Fe Pacific.—The officers and directors of this company, a notice of whose formation is given in another column, are as follows: Chairman of the Board, Aldace F. Walker; President, Edward P. Ripley; Third Vice-President, Paul Morton; General Manager, W. G. Nevin; General Counsel, Victor Morawetz; General Solicitor, E. D. Kenna; General Auditor, H. C. Whitehead; Comptroller, J. P. Whitehead; Secretary and Treasurer, G. Holterhoff, Jr.; Assistant Secretary, L. C. Deming; Assistant Treasurer, H. W. Gardner; Directors, Aldace F. Walker, R. Somers Hayes, Victor Morawetz, Edward P. Ripley, Edward J. Berwind, H. R. Duval, Thomas P. Fowler, Edward N. Gibbs, George G. Haven, Benjamin P. Cheney, George A. Nickerson, William Rotch and Charles S. Gleed.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Augusta Northern & Gulf.—This company has recently been incorporated in Georgia to build a road in Worth County from Sylvester, a point on the Brunswick & Western, northeast about 20 miles to Worth. The capital stock of the company is $100,000. The incorporators are: E. M. Tansey, J. A. Heinson, P. I. Miller, R. C. Miller, J. R. Williams, W. H. McPhaul, J. S. Westberry, W. S. Sikes, T. R. Perry, J. T. Cochran, T. Tipton, J. J. McDowell and J. J. Forehand.

Augusta Terminal.—A 99-year lease of this road to the Charleston & Western Carolina was made June 9 for an annual rental of $36,000. The Augusta Terminal Company was formed the early part of this year to build a road from a point on the Charleston & Western Carolina, along the Savannah River to Washington street, Augusta, Ga., at the junction of the Southern and South Carolina & Georgia Railroads, about 2½ miles.

Baltimore & Ohio.—The new yards of the company in Glenwood and Hazlewood and the new branch line at Pittsburgh, known as the "Glenwood Cut-off," were opened for traffic June 20. On the "Glenwood Cut-off" the track passes over a trestle 5,000 ft. long, which is to be filled with furnace cinder by Jones & Laughlins. The average height of this trestle is 45 ft. The new yards extend from a new station called Wheeling Junction, to the east end of the trestle.

Columbia & Kootenay.—It was announced in these columns last week that contracts had been given for the first 16 miles of the Slocan extension of this road. The contract for the balance has been given to J. G. McLean & Co., of Nelson, B. C., and Seattle, Wash. The extension will run from a point on the main line near the mouth of the Slocan River north, 30 miles, to the southern end of Slocan Lake.

Danville & Asbestos.—This road, to connect the mines of the Asbestos & Asbestic Co., of Asbestos, Que., with the Grand Trunk at Danville, 4¾ miles east, is now being built by J. McCarthy, contractor, of Sherbrooke, Que., and the road must be finished by the middle of August. The contract price is $45,000.

Great Northern.—The contract for an extension of the Pembina Mountain line, known as the Cavalier Branch, which runs from Grafton, N. Dak., northwest 32 miles, to Cavalier, has been given to A. Guthrie & Co., of St. Cloud, and work has already been begun. The extension is to run from Cavalier in a northwesterly direction to Walhalla, 18 miles. A contract has also been given to the same firm for an extension of the Larimore & Langdon Branch from Langdon, N. Dak., northwest 22 miles to a point near the Canadian line.

Intercolonial.—The Canadian government has recently concluded arrangements with the Drummond County Railroad and with the Grand Trunk to secure an entrance for this road to Montreal. The Drummond County, which now extends from Ste. Rosalie, opposite St. Hyacinthe, northeast 68 miles to Forestdale, agrees to extend its line northeast 35 miles to Chaudiere, on the Intercolonial, and to lease the completed line to the government for 99 years at an annual rental of $64,000, being four per cent. on $1,600,000, the estimated cost of a new line between Chaudiere and Ste. Rosalie. The government will also assume a contract with the Grand Trunk, now held by the Drummond County, to pay $6,000 for the privilege of crossing the bridge of the former road at Chaudiere to a connection with the Intercolonial. The Drummond County now reaches Montreal from Ste. Rosalie over the tracks of the Grand Trunk, and for this trackage right the government is to pay $37,500 a year. For the use of the Grand Trunk's terminal facilities in Montreal the government will pay $62,500 a year and a further payment of $40,000 a year will be made for the use of the Victoria bridge, making a total of $210,000 a year for the extension of the road from Chaudiere to Montreal.

Kinzua & Tiona.—This company was chartered at Harrisburg on June 21 to build a railroad eight miles long in Warren County, Pa., from Dew Drop, on the Western New York & Pennsylvania, southwest to Tiona on the Philadelphia & Erie. The names of the officers are given in another column.

Lehigh Valley.—Work was begun June 17 on an extension to be built from Geneva Junction, N. Y., immediately east of Geneva, northeast to Seneca Falls, about nine miles. The line will be single track, and will follow the Seneca outlet on its south side to Waterloo and thence to Seneca Falls. The contract for the work has been given to John F. Dolan. A large amount of material for the branch is already on the ground. The new line will be known as the Seneca County Railroad.

Little Kanawha Valley.—Joseph Fuccy, of Weston, W. Va., who has the contract for the first 40 miles of this road from Parkersburgh, has sublet the work to Gooche, Rinehart & Dennis, of Covington, Va., and that portion of the line is to be completed by Jan. 1 next. Grading was begun at several points between Parkersburgh and Elizabeth on June 21. The road is to extend from Parkersburgh, W. Va., in a general southeasterly direction along the valley of the Little Kanawha River through Wood, Calhoun, Gilmer and Braxton counties to Sutton, Braxton County, a station on the West Virginia & Pittsburgh.

Mexican Roads.—A concession signed by Minister Mena in favor of Joaquin P. Riveroll for a railroad from a point on the San Augustine River or from Alonzo Lazaro north to San Andreas Tuxtla and Catemaco, has been approved by the government. The concession provides for an extension of the line to Santecomapan and to the port of Alvarado. It is understood that the road will be built by English capitalists.

A report from Vera Cruz, Mex., states that the new road from Merida southwest about 100 miles to the city of Campeachy will be completed and placed in operation next fall. It is announced that the company building this line has applied to the Mexican government for a concession to extend the road from Campeachy southwest to San Juan Bautista and thence to Salina Cruz on the Isthmus of Tehuantepec. It is expected that the

government will grant this concession and will give the company a liberal subsidy.

Milford, Matamoras & New York.—This company has recently been incorporated in New York state to build a line one mile long from a connection with the Erie Railroad at Port Jervis across the Delaware River to a point in Pennsylvania, near Matamoras. The capital stock of the company is $50,000. The directors are Lewis H. Smith, P. R. Deyo and P. T. Sargent, of New York City; L. Marthemont, of Milford, Pa., and W. K. Ridgeway, of Matamoras, Pa.

Mississippi & La Fourche.—The contract for the first 10½ miles of this road, from Belle Alliance, near Donaldsonville, La., south to Napoleonville, has been given to Barbour & Ruple, of New Orleans. The rest of the line from Napoleonville to La Fourche Crossing will be placed under contract this month. The road will be about 35 miles long, extending from Donaldsonville in a general southeasterly direction to La Fourche Crossing, passing through Napoleonville, Bertie, Labadiesville and Thibodaux; it will connect with the Southern Pacific at La Fourche Crossing. R W. Edward, Donaldsonville, La., is President, and H. C. Smith, Lauderdale, La., is Chief Engineer.

Moore County & Western.—At a recent meeting of the Commissioners of Cabarrus County, N. C., it was voted to turn over the $75,000 of bonds voted by the people of the county several years ago in aid of another railroad scheme to the officials of this proposed road. The line is to extend from Concord, N. C., on the Southern, east 37 miles to Craigrownie, the western terminus of the Moore County Railroad. The latter will be used for entrance to Aberdeen to a connection there with the Seaboard Air Line.

Noble Lake & Southern.—This company has recently been incorporated in Arkansas to build a railroad from Noble Lake, a point on the St. Louis, Iron Mountain & Southern, in Jefferson County, Ark., 4 miles, to Ladd. The capital stock of the company is $10,000. The incorporators are: E. P. Ladd, President; C. S. Bacon, Vice-President and Secretary; J. Ladd and A. Bacon.

Oregon Improvement Co.—Work of changing the road from narrow to standard gage has been begun. The road extends from Seattle, Wash., to Coal Creek, 21 miles, with branches from Renton to Franklin, 21 miles, from Maple Valley to Taylor, 10 miles, and from Black Diamond to Bruce, three miles. It is reported that the bridges at Renton, at Maple Valley and at a point a few miles east of Renton will be rebuilt.

Pecos Valley & Northeastern.—Amended articles of incorporation of this company were filed in New Mexico June 17. The capital stock is $6,000,000, of which, it is stated, $220,000 has been already paid in. The company proposes to buy the Pecos Valley Railroad, which extends from Pecos, Tex., north 164 miles to Roswell, N. Mex., and to extend the road from Roswell northwest about 220 miles to the Texas Panhandle to connect with other lines at Amarillo, Washburn or Panhandle City. The directors of the company are; J. J. Hagerman, W. A. Otis, R. J. Bolles, of Colorado Springs; E. O. Faulkner, of Eddy, N. Mex.; E. W. Kenna, of Chicago; D. McCool, of St. Louis; J. W. Poe, of Roswell, and Charles A. Otis, of New York. The offices are at Eddy, N. Mex., and Colorado Springs.

Plymouth County.—The Massachusetts Legislature has extended the time for building this road two years, and has given the company permission to issue promissory notes for $500,000 to be protected by a lien on its equipment and franchise. The road is proposed to extend from East Weymouth, on the South Shore Branch of the Old Colony Railroad, in Eastern Massachusetts, through Hingham, Norwell and Marshfield to Brant Rock, in Marshfield, with a branch from North Marshfield to Hanover, a total length of 25 miles. Surveys were made early in 1895, and the contract for building let to John Leavett, of 213 Huntington avenue, Boston, but no work was done. John F. Simmons, Equitable Building, Boston, is President, and E. Worthington, Jr., 53 State street, Boston, is Chief Engineer.

Rio Grande, Sierra Madre & Pacific.—This road has been completed from Ciudad Juarez, opposite El Paso, Tex., 157 miles southwest to Casas Grandes, Mex., via Corralitos, and it is proposed to put the road in operation as soon as it has been accepted by the Mexican government. It is proposed ultimately to extend the road from Casas Grandes to Topolobambo, on the Pacific Coast.

Short Line, W. Va.—New location surveys are being made for this road, which was chartered about a year ago in West Virginia, to extend fram Clarksburgh, Harrison County, northwest about 45 miles to the Ohio River at New Martinsville by way of the West Fork River Valley and Fishing Creek. It is reported that Thomas M. Jackson, chief promoter of the line, has interested a number of New York capitalists and that the counties through which the road will pass have made liberal donations. A small amount of grading was done last year. Joseph Fuccy, of Weston, W. Va., has the contract.

Sistersville & Mannington.—It is expected that this road, which was chartered about a year ago to extend from Parkersburgh, W. Va., on the Ohio River northeast about 70 miles to Mannington, W. Va., on the Baltimore & Ohio, will shortly be built. Representatives of the Standard Oil Co. have recently visited Sistersville and it is reported that they have made arrangements with the original promoters to build and control the line. The region through which it will pass is said to be rich in oil. Tyler County has voted $60,000 and Wetzel County $30,000 in aid of the enterprise.

Southeast Alabama.—It is announced that a contract has been let to Vandiver, Abercrombie & Williams, of Atlanta, Ga., for this proposed line in Alabama, which is to form a branch of the Plant System. The road is to extend from Newton, Dale County, on the Plant System, east via Enterprise to Elba, Coffee County, 36 miles. It is proposed to complete the road by Feb. 1, 1898.

Staceyville.—This company has been incorporated in Iowa to build a railroad from Staceyville, Ia., west or southwest about eight miles to a connection with the Illinois Central. The capital stock is $100,000. The incorporators are: W. J. Knight, President; C. H. Booth, Treasurer; Alfred Penny, Charles G. Rolfe, W. L. Eaton, F. B. Harriman, W. S. Benson and T. W. McNear.

Tennessee Northern.—Grading has been completed from Careyville, Campbell County, Tenn., a point on the Southern Railway, northeast 12 miles to La Follette, and tracklaying was begun June 15. After finishing the line to La Follette, it is proposed to extend it 18 miles north to Jellico, Tenn., and from Jellico 24 miles east to Middlesboro, Ky. Another extension is proposed from Careyville southeast to Knoxville, about 35 miles. J. K. Stroufe, La Follette, Tenn., is Chief Engineer.

Texas, Arkansas & Louisiana.—The extension of this road from Atlanta, Tex., to Bloomburg, a station on the Kansas City, Pittsburgh & Gulf, is expected to be opened for traffic by Sept. 1. The grading has all been done and nearly all of the track is laid. The road, which is 21 miles long and narrow gage, is now used for logging purposes. Edward Rand, Atlanta, Tex., is Superintendent.

Virginia & Carolina.—The purchase of this road (referred to in our issue of March 12 as the Richmond, Petersburgh & Carolina) from the city of Petersburgh, Va., has been concluded by Dewitt Smith, of New York City, who has deposited $20,000 as a forfeit under the provisions of the contract. By the terms of the contract Mr. Smith agrees to organize a company to build and equip the road, and to erect a brick passenger and freight station in Petersburgh. First mortgage bonds of the company to the amount of $100,000 par value will be issued to the city of Petersburgh. The road, which was chartered several years ago to run from Richmond, Va., to Ridgeway, N. C., on the Seaboard & Roanoke Railroad, was graded for about 20 miles out of Petersburgh and piers were built for a bridge across the Roanoke River in North Carolina. The terms of the sale require that the road be completed within 12 months.

Electric Railroad Construction.

Bangor, Me.—Surveys are being made on the electric road to connect Bangor with Glenburn, Kenduskeag, Corinth and Charleston. The entire length will be 26 miles, and work will begun by fall.

Boston, Mass.—The Executive Committee of the Boston Elevated Railroad Co. has been authorized to obtain estimates for the construction of the elevated railroad structure and to prepare a schedule of the value of the property which will be directly affected by the change.

Buffalo, N. Y.—The Buffalo Bridge & Iron Works has been given the contract for the poles for the first 15 miles of new electric line to be built by the Buffalo Traction Co., work on which has already been begun.

Cripple Creek, Col.—The City Council has granted to C. E. McBall and C. E. Rolley a franchise to build an electric or cable railroad. The deposit of $500 will be forfeited if the road is not in operation by Aug. 1 of this year.

Danville, Pa.—The North Susquehanna Street Railway Co. asks the right of way for its line between Danville and Bloomsburg. The road will start at Riverside, and after taking in the principal streets of Danville will pass on to Bloomsburg and Espy, a line branching off at Rupert for Catawissa.

East Liverpool, O.—The new owners of the East Liverpool & Wellsville Street Railway Co. propose to make improvements amounting to $40,000.

Easton, Pa.—A charter has been granted to the Easton, Palmer & Bethlehem Street Railway Co. to build a road from Easton to Bethlehem, and form an immediate link between the lines of the Easton Transit Co. and those of the Allentown and Lehigh Valley Traction Co. The capital stock of the company is $150,000. The officers are: W. B. Ferguson, Boston, Mass., President; Charles E. Barnes, Plymouth, Mass., Treasurer. C. A. Richardson, Boston, Mass.; C. W. Shippee, Thos. A. H. Hay, W. O. Hay, S. G. Reynolds and Edward J. Fox, Easton, Pa., are the Directors.

Greensburg, Pa.—A report states that a syndicate headed by Colonel Wayman, of New Kensington, proposes to build an electric line from New Kensington to Greensburg, through Murrayville.

Hamilton, Ont.—The Brantford Street Railway Co. is seeking to arrange with the Hamilton, Chedoke & Ancaster Electric Railway Co. to make a direct connection with Paris by way of Brantford.

Lima, O.—The Lima Street Railway Co. has asked for permission to extend its track on Wayne and Pine streets.

Meadville, Pa.—Johnson & Wickersham, of Media, Pa., have received the contract for building an electric railroad at Meadville. Five miles of the road are located directly in Meadville and six miles touching a point known as Ponce de Leon Springs.

Moosehead, Me.—Mr. O. A. Dennen, of Kineo, Me., informs us that there is no truth in the report that an electric road is projected from Cumberland Lakes to Moosehead.

Olean, N. Y.—Work is to begin at once on improving and extending the street railroads of this place. Boardmanville, East Olean, Weston's Mills and Portville are to be connected with the city.

Philadelphia, Pa.—The Street Railway Committee of Councils has referred to a sub-committee the ordinance granting to the Union Traction Co. the right to extend its system to League Island.

Portland, Me.—The Westbrook, Windham & Harrison Railway Co., which was recently incorporated, has elected the following directors: Arthur W. Merrill and William M. Bradley, of Portland. J. C. Scrates has been elected President; C. B. Woodman, Vice-President; C. M. Waterhouse, Treasurer, and J. H. Tolman, Secretary. All the above officers reside at Westbrook.

Sherbrooke, Que.—The Southern Counties Railway Co. has been incorporated and proposes to build an electric road from the northern limit of Chambly District through the district of Vercheres and Rouville, and west to Sherbrooke.

Wheeling, W. Va.—Our correspondent informs us that the Wheeling & Elm Grove Railroad, operating between Wheeling, W. Va., and Triadelphia, W. Va., a distance of 12 miles, will discontinue the use of steam and put in an electric plant. The City Council of Wheeling and the Commissioners of Ohio County, W. Va., have passed an ordinance granting right of way over streets and pikes, so the company may build a double-track line, and also permitting new track to be laid so that the Baltimore & Ohio, Panhandle and Union terminal railroad stations and the river wharf may be reached. The ordinance provides for 5-cent fares throughout the line, while at present from 5 to 20 cents a trip is charged, according to distance between stations. Standard gage T-rail track is to be used and on all streets the paving which is disturbed must be relaid with new materials. The franchise runs for 30 years and provides for payment to the city of $300 a mile annually for 10 years and $1,000 a mile annually during the remainder of the life of the franchise. A 10 minute schedule from 5 a. m. till 11 p. m. is provided for. The company's plans are now preparing, and the contract for construction, cars and power plant will be let within 60 days, and the new plant must be in operation within one year.

Wilkes Barre, Pa.—The Wilkes-Barre & Wyoming Valley Traction Co. contemplates building short branch lines in the near future, reaching out from Pittston, one to Taylorville and another to Inkerman and also to lay a double track on Wyoming avenue from Kingston to Vaughn's corners.

Winthrop, Mass.—The Winthrop Street Railway Co. has been incorporated with a capital stock of $80,000 to build a street railroad eight miles in length. Among the directors are: W. G. Weildon and William W. Davis, Boston; S. G. Irwin, Winthrop; G. S. Forbush, Brookline, and Charles E. Folsom, Winchester.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—On behalf of the members of the New York Reorganization Committee S. M. Felton, President and Receiver of the Cincinnati, New Orleans & Texas Pacific, left Baltimore June 21, in company with General Manager Greene, Chief Engineer Manning, General Superintendent Fitzgerald and Assistant General Superintendent Gibson, to inspect the physical condition of the company's property. The New York Committee consists of Gen. Louis Fitzgerald, Chairman; Eugene Delano, William Reed, Howland Davis, E. R. Bacon, August Belmont and Henry Budge.

Baltimore & Ohio Southwestern.—The road has arranged for an extension of the Ohio & Mississippi consolidated mortgage bonds, which will mature Jan. 1, 1898, for a term of 50 years from Jan. 1, 1897, with interest at four per cent., payable July 1 and Jan. 1 of each year. New bonds will be issued and bear the guarantee of the Baltimore & Ohio Railroad.

Boston Terminal Co.—The company has authorized Messrs. Lee, Higginson & Co. to exchange the $6,000,000 new Terminal Company 50-year 3½ per cent. currency bonds for the $6,000,000 3½ per cent. short term bonds not outstanding. The new bonds will be guaranteed against taxes by the Boston Terminal Co.

Cape Fear & Yadkin Valley.—Judge Simonton, in the U. S. Circuit Court at Raleigh, N. C., has reaffirmed his decree given last April ordering a sale of this road as a whole. The case was reopened at the request of representatives of certain New York bondholders who desired that the road be sold in sections represented by the three series of bonds. The upset price of the road has been fixed at $2,000,000 and all bidders will be required to deposit $30,000 with the special masters. The sale will take place at Fayetteville, N. C., some time during August. The road, which extends from Wilmington to Mt. Airy, N. C., 248 miles, with several branches, has been in the hands of a Receiver for three years.

Central Pacific.—A committee consisting of Charles S. Fairchild, Chairman; Thomas F. Bayard, Silas B. Dutcher and Edward Morrison, Jr., of New York, and Lord Monkswell, Sir John Lubbock and Walter Morshead, of London, has been formed to arrange with the creditors for the reduction of its debts by the application of the sinking funds, the reduction of interest charges by the issue of new obligations at lower rates, the final adjustment of all claims of the government and the settlement of all claims of the Southern Pacific. Upon the reorganization of the company it is proposed that the road be operated by directors selected by the stockholders, or leased under proper guarantees. A plan of reorganization based on the above objects has been prepared by the committee, and copies may be had from the New York Security & Trust Co., New York City.

Chattanooga & Lookout Mountain.—This road, which extends from Chattanooga, Tenn., to the top of Lookout Mountain, was sold on June 22 by Simpson Africa, representative of the Union Trust Co., of Philadelphia, to the Chattanooga & Lula Lake Railroad Co., which operates the new incline to Lookout Mountain, for $15,000. The road was built in 1888 and is 10 miles long.

Chicago Terminal Transfer Co.—A trust deed for $16,500,000 in favor of the U. S. Trust Co., of New York, and John A. Stewart, trustee, was filed at Chicago on June 21. The deed is a first mortgage on all the property formerly owned by the Chicago & Northern Pacific, and a lease for 999 years on the property of the Chicago & Calumet Terminal Co. The bonds given will mature 50 years from July 1 next and bear four per cent. interest.

Colorado Midland.—The Olcott Committee has issued its plan of reorganization of this property and it is to be submitted to certificate holders for ratification July 15. The new securities proposed to be issued are $10,000,000 four per cent. 100-year first mortgage bonds; $6,000,000 non-cumulative four per cent. preferred stock and $4,000,000 common stock. The present first mortgage bondholders are asked to submit to a reduction from six per cent. to four per cent., and to take new first mortgage bonds bearing two per cent. obligatory interest for the next three years, three per cent. obligatory for the following two years and four per cent. thereafter. As a bonus, $5 0 in new preferred stock is to be given with each $1,000-bond. The four per cent. consolidated bonds are required to pay 15 per cent. assessment and take in exchange new securities as follows: For assessment, 15 per cent. in new first mortgage bonds bearing full four per cent. interest from July 1, 1897; 30 per cent. in preferred stock and 70 per cent in common stock; $334,000 in first mortgage bonds and $153,000 preferred stock is set aside for payment of maturing equipment bonds; $1,250,000 first mortgage bonds and $625,000 preferred stock for purchase of the Bush tunnel and $108,000 first mortgage bonds and $54,000 preferred stock for acquisition of the Aspen Short Line bonds. The remainder of the proposed new bonds ($1,355,100) is to be devoted, $500,000 reserved, to redeem prior lien bonds which may be issued in case the 15 per cent. assessment fails to provide the necessary funds for reorganization, and the balance for new construction and improvement. There will remain, also, $590,700 preferred stock and $579,800 common stock available for new construction and improvements. The present funded debt is $12,798,000, on which obligatory interest is $686,320; taxes and rentals, about $145,000; total, $831,320. Proposed fixed charges under plan (including estimated taxes and rentals): First year, $372,051; fourth year, $428,296; sixth year, $490,796. Surplus earnings for 1895 are stated as $210,336; 1896, $413,052; 1897 (2 months estimated) $176,691. The committee estimate requirements as $692,500, distributed as follows: To take up Receiver's notes, $250,000; new rolling stock, $167,500; rails, $115,000; terminal facilities and shops, $160,000. The plan contains a stipulation for the release of any claim by the con-

solidated mortgage bondholders upon the guarantee of the Atchison, Topeka & Santa Fe, in return for which the latter company relinquishes certain claims against the Colorado Midland.

Columbus, Hocking Valley & Toledo.—At the request of a number of the holders of the joint 6 per cent. 20-year gold bonds of this company and of the Hocking Coal & Railroad Co., dated July 1, 1884, Messrs. Robert Maclay, Jules S. Bache, William D. Barbour, Charles C. Edey and George H. Holt have consented to act as bondholders' protective committee under an agreement, copies of which can be obtained from the Knickerbocker Trust Co., New York City. The committee recommends the holders of the above mentioned bonds to take prompt action by depositing these bonds with the Knickerbocker Trust Co. on or before July 1 next.

Concord & Montreal.—At a special meeting of stockholders, held recently at Concord, N. H., an issue of $650,000 of bonds was authorized to reimburse the Boston & Maine for an expenditure of that amount on account of a suit decided in favor of the stockholders of the Manchester & Lawrence, the payment of future claims against that road having been guaranteed by the Concord & Montreal in its lease to the Boston & Maine, June 29, 1895. The suit in question was for a share in surplus earnings claimed to have accrued when the Manchester & Lawrence was operated by the Concord & Montreal.

Kansas Central.—The foreclosure sale of this road, which was to have taken place June 15 at Leavenworth, Kan., has been postponed by Master-in-Chancery Dillon, of Topeka, until June 25. This is the second postponement of the sale. The road extends from Leavenworth to Miltonvale, Kan., 165 miles. The property was placed in the hands of Receivers on Oct. 13, 1893.

Lake Erie & Western.—The annual report of the company, recently issued, shows a surplus of $134,389, against $309,204 in the previous year. The capital stock remains the same, and the total funded debt is $10,875,000. During the year $500,000 second mortgage bonds were sold from the company's treasury for improvements and equipment. The gross earnings for the year decreased $174,830 and the net earnings decreased $175,945. The freight traffic decreased 1.01 per cent. in tonnage. Earnings per ton-mile decreased from .661 to .618 cent. and gross receipts from this source decreasad 3.87 per cent. Passenger traffic decreased 1.55 per cent. in the number of passengers carried and 5.9 per cent. in earnings. The ratio of expenses to earnings, exclusive of taxes, was 57.33 as against 54.45 for the previous year. During the year $219,366 was spent in additions and betterments, including $63,248 for automatic couplers and air brakes. The quarterly dividend of 5 per cent on preferred stock was discontinued, and from the surplus of $134,389 there has been advanced $125,000 to the Northern Ohio on account of interest on the bonds guaranteed, leaving a net surplus for the year of $9,389. The general balance sheet of Dec. 31, 1896, shows total assets of 37,498,530, an excess of $1,064,935 over total liabilities.

New York Central & Hudson River.—The earnings for the three months and for the year ended June 30 have been reported as follows:

Three Months:	1897.*	1896.	Inc. or Dec.
Gross earn	$11,055,000	$10,852,655	I. $202,345
Oper. expen	7,159,000	7,237,083	D. 78,083
Net earn	$3,896,000	$3,615,572	I $280,428
First charges	2,640,000	2 722,574	D. 82,574
Profit	$1,256,000	$892,998	I. $363,002
Dividend	1,000,000	1,000,000	
Surplus	$256,000	def. $107,002	I. $363,002
Year:			
Gross earn	$44,127,000	$45,144,967	D. $1,017,967
Oper. expen	29,540,000	30,455,570	D. 915,570
Net earn	$14,587,000	$14,689,397	D. $102,397
First charges	10,540,000	10,645 604	D. 105,604
Profit	$4,047,000	$4,043,793	I. $3,207
Dividend	4,000,000	4,000,000	
Surp'us	$47,000	$43,793	I $3,207

*Estimated for 1897.

Northeastern of Georgia.—This road was put up at auction at Atlanta, Ga., on June 21, but no bids being received the sale was postponed. It was held that the upset price of $287,000 was too high. The road extends from Athens north to Lula, Ga., 140 miles.

Ogdensburgh & Lake Champlain.—At the recent annual meeting of stockholders, held at Ogdensburgh, N. Y., it was decided to postpone the election to next February. The stockholders then elected the following officers and directors: President, Charles Parsons; Treasurer, Charles G. Burnham; Secretary, Henry Parsons; Directors, Charles Parsons, Charles R. Batt, William Lummis, George Parsons, P. Y. R. Ely, Hiram A. Hodge, Edwin Parsons, C. S. Day, Walton Ferguson and Daniel Magone. Charles Parsons is the present Receiver of the company, appointed by United States Judge Wallace. The Central Vermont has had control of the road for a number of years, and at the foreclosure sale, soon to take place, it is expected that the property will be bought in by the Bondholders' Committee, of which Mr. Parsons is Chairman.

Ontario & Rainy River.—The charter of this company, which heretofore has been held by Messrs. D. F. Burke, G. O. P. Clavet, J. McTelgue, R. E. Mitchell, M. Dwyer and T. A. Gorham, all of Port Arthur, Ont., has been transferred to Messrs. W. McKenzie and R. A. McKenzie, of Toronto. The Canadian government has already subsidized this road at the rate of $3,000 per mile for 80 miles, and further negotiations are now being made. The road is proposed from a point on the Port Arthur, Duluth & Western, northwest to Fort Frances, the objective point being Winnipeg.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The earnings for May and for the five months ended May 31 have been reported as follows:

May:	1897.	1896.	Inc. or Dec.
Gross earn	$1,100,779	$1,210,829	D. $110,050
Oper. expen	851,675	924.219	D. 72.544
Net earn	$249,104	$286,610	D. $37,506
Fixed charges	294,928	308,195	D. 13,267
Deficit	$45,824	$21,585	I. $24,239
Five months:			
Gross earn	$5,513,728	$6,052,161	D. $508,433
Oper. expen	4,274 941	4,757,137	D. 482,226
Net earn	$1,268,817	$1,295,024	D. $26,207
Fixed charges	1,385,101	1,404,946	D. 19 845
Deficit	$116,284	$109,922	I. $6,362

San Antonio & Gulf.—The original stockholders of the San Antonio & Gulf Shore, headed by William Davis, the former President of that company, have filed suit at San Antonio, Tex., to set aside the recent sale of the road and to have the property restored to them. It is claimed that the road was sold for the debts of the contractors, and that when those debts were paid the lien on the property was released. It is asked that the the present owners be restrained from incumbering, mortgaging or leasing the road until the present suit is decided, and also that the Court place the road again in the hands of a Receiver.

Santa Fe Pacific.—A certificate of organization of this company has been filed with the Secretary of the Interior at Washington, D. C. The company is formed under an act of Congress approved March 3, 1897, to take over the property of the Western Division of the Atlantic & Pacific, which extends from Atlantic and Pacific Junction, 12 miles west of Albuquerque, N. Mex., to the Needles, Cal., 565 miles. This property was sold under foreclosure of the first mortgage on May 3 last, and was purchased by a committee acting in the interest of the Atchison, Topeka & Santa Fe. The stock and bonds of the Santa Fe Pacific will be pledged under the general mortgage of the Atchison, Topeka & Santa Fe, by which the road will be consolidated for operating purposes with the Southern California. The names of the officers and directors of the new company are given in another column.

Terre Haute & Indianapolis.—On June 19 the Superior Court of Marion County, Ind., decided in favor of the state in its suit against this company to recover about $2,000,000 claimed to be due under the terms of a special charter issued to the company in 1847 and under which it has since been operated. The charter provided that the railroad company should pay the state school fund all its earnings in excess of 10 per cent. over the cost of operation and construction.

Wilmington, Newbern & Norfolk.—It is announced that this road will be sold at Wilmington, N. C., on July 15. The decree of foreclosure was given by Judge Simonton, in the United States Circuit Court at Charleston, S. C., May 27. A. M. Waddell is Master Commissioner. The upset price will be $250,000 and each bidder must deposit five per cent. of the amount of his bid in cash, or $25,000 in certain mortgage bonds of the road. The road extends from Wilmington to Newbern, N. C., 87 miles. H. A. Whiting, of Wilmington, was appointed Receiver on March 15, 1896.

Electric Railroad News.

Asbury Park, N. J.—The Atlantic Coast Electric Railway, now running from Asbury Park to Pleasure Bay, has absorbed the Asbury Park & Belmar Trolley Co. It is stated that the latter road will be begun at once.

Baltimore, Md.—The Baltimore Consolidated Railway Co. was organized June 17, the stockholders of the Baltimore Traction Co. and the City & Suburban Co. voting to consolidate the roads. The capital stock is $10,000,000, consisting of 400,600 shares. The new company will issue $12.000,000 4½ per cent. gold bonds, $10,500,000 of which will be used to retire the divisional mortgages, the remainder going into the treasury. The new company operates 185 miles of track. Of the new stock 196,000 shares go to the Traction Company, while the City & Suburban gets 163,600. The officers of the new company are: President, Nelson Perin; Vice-President and General Manager, William A. House; Treasurer, F. S. Hambleton; Secretary, J. F. Heyward.

Brockton, Mass.—The East Bridgewater & Brockton Street Railway Co. has given a check for $10,000 as a forfeit if the road is not built within 18 months.

Detroit, Mich.—Mr. John B. Dyar, who has been the chief promoter of the Detroit-Huron Interurban Electric Railroad, has transferred property and securities valued at $200,000 to a trustee for the benefit of creditors.

Jersey City, N. J.—The stockholders of the Consolidated Traction Co. have ratified the purchase of the line from Belleville to Passaic, heretofore operated by the Passaic & Newark Traction Co. This purchase gives the Consolidated Traction Co. a through route from Jersey City to Paterson.

Staunton, Va.—The City Street Car Co., of Staunton, is in the market for either 50, 56 or 60 lb. T rails for immediate use together with the necessary tie plates.

TRAFFIC.

Traffic Notes.

Corn is being carried to Buffalo by lake at one cent a bushel. Rates from Lake Superior ports to Buffalo are also very low.

The Secretary of Agriculture has notified the railroads that scabies of sheep, a contagious disease, exists in the United States, and that cars in which animals affected with such disease have been carried must be disinfected with a five per cent. solution of crude carbolic acid in water.

General Passenger Agent George H. Daniels, of the New York Central, went to Washington last week, and made an argument, before Senate Committee, in favor of the proposed law to prohibit brokerage in tickets. It appears, however, that there is little chance that any law will be passed before next December.

At the annual meeting of the Texas Car Service Association last week it was reported that during the year ending May 31 the association handled 612,935 cars, against 550,359 last year, at an expense of 21 per cent. less than the year 1895-96. W. G. Van Vleck, of the Southern Pacific, was elected Chairman, and Chas. B. Peck was re-elected Manager.

The Board of Managers of the Joint Traffic Association have promised the wholesale merchants of New York City to reduce round trip rates about one-third for a few days next autumn for the benefit of retail merchants visiting New York, and it seems to be understood that the reduction will be repeated every spring and fall. No sooner is the announcement made than the merchants of Philadelphia come forward with a demand for a similar reduction to that city.

Iowa Grain Shippers' Suits for Overcharges.

The suits against railroad corporations to recover $1,600,000 for alleged excessive charges on grain shipments from Iowa were thrown out of court at Des Moines, Ia., June 16, by Judge Shiras.

Press despatches state that the Judge held that it was a sufficient defense that the rates charged were those established and published according to the provisions of the Interstate Commerce law. A schedule so established is itself the standard of reasonableness until the Interstate Commerce Commission takes action. Should the schedule promulgated by a railroad company be thought unreasonable the remedy pointed out by the Interstate Commerce law is not a suit for damages for extortion, but a petition to the Interstate Commerce Commission to modify the schedule. Should a railroad company impose rates higher than those named by such commission it becomes liable under the act to damages for extortion.

Judge Shiras entered judgment in five of the fourteen cases and gave plaintiff 30 days to amend its bill. It is expected the cases will be taken to the Circuit Court of Appeals.

Relative Rates from Competing Localities.

The Interstate Commerce Commission, in a report prepared by Commissioner Prouty, has dismissed a complaint of the Cincinnati Chamber of Commerce concerning freight rates to Montgomery and Southwestern territory from Cincinnati and from Louisville. It was claimed that Louisville was unduly favored; and, on the other hand, the opponents of Cincinnati claimed that that city enjoyed an advantage, in that rates on freight from the East were lower than on the same freight to Louisville. The findings of the Commission are set forth in the report as follows:

1. A city is entitled to benefits arising from its location, and the fact that it enjoys exceptional advantages in one respect is no reason why it should be subjected to discrimination in other respects.

2. The location of Cincinnati upon the north bank of the Ohio River, and the fact that railroads leading south must cross that river by expensive bridges for which an arbitrary or toll is charged, or allowed in the division of rates, justify some higher differential on rates from Cincinnati over rates from Louisville, on the south bank of the river, to points in so-called "Montgomery and Southwestern Territory."

3. Distance is an important element in the determination of rates, and in the absence of other influences it is a controlling factor. When carriers claim justification for higher rates from a competing locality on the ground of greater distance, and the complainant, representing such locality, fails to show circumstances which operate to eliminate distance from consideration or to counteract its influence, such higher rates, if made in accordance with the principle of distance, will not be held unreasonable.

4. While existing differentials which result in higher freight rates from Cincinnati than from Louisville to "Montgomery Territory" and "Southwestern Territory" may, as a whole, discriminate against Cincinnati, the inequality arises, if it exists, through combinations of rates to Cincinnati and Louisville from territory north of the Ohio River with rates from those points south; there is no showing whether the fault lies with rates north or south of the river, and neither of the carriers operating north of the river is a party to this proceeding. It fairly appears, on the other hand, that if such differentials were entirely abolished, the rates from a large section north of the Ohio would be against Louisville. The complainant asks in its petition that the higher rates from Cincinnati than from Louisville be prohibited; re-adjustment of present rates is not prayed for, and only the fact of distance is presented as a basis for determining whether the higher rates from Cincinnati are unjust or what rates would be just. *Held*, That the complaint should be dismissed without prejudice.

Chicago Traffic Matters.

CHICAGO, June 23, 1897.

The general freight business of the roads west of Chicago is now quite good, and there is a free movement of grain. The receipts of grain by rail at Chicago last week were nearly 5,000,000 bushels, much above the average for the past four years.

The Ogden gateway has been the principal topic in Western railroad circles during the past week. The Union Pacific withdrew from all the passenger agreements, and would give no further assurances of co-operation with any of the members of the Western Passenger Association. When the Oregon Short Line was part of the Union Pacific system it was allowed on divisions of both passenger and freight traffic 1¾ miles for every mile hauled. When the Oregon Short Line became an independent road as a result of its reorganization the Union Pacific refused to allow it more than mile for mile, so the Short Line people negotiated with the Rio Grande Western, and that road (and the D. & R. G.) agreed to allow the O. S. L. 1¾ miles as had been done in years past by the Union Pacific. The Union Pacific then withdrew from the passenger agreement, but its officers and the Oregon Short Line people are to meet in New York this week to settle their differences.

For the Elks convention, in Minneapolis, in July, the Eastern roads have made a round trip rate of $13 from Cincinnati and $12 from Indianapolis to Minneapolis, and so there is more trouble; and the Wisconsin Central is continuing to deal with brokers, tickets being obtainable through the scalping offices from Chicago to St. Paul at $9.50, which is $2 under regular tariff. The trouble caused by the St. Paul's issue of teachers' tickets over the eastern lines, without authority, has seemingly come to an end, the Nickel Plate road having ordered these tickets repudiated. The St. Paul road has been very energetic in its efforts to clear the market of the tickets sold at St. Paul and Minneapolis, and has already redeemed from brokers about half of all they had.

The Wisconsin Central road, which it was hoped would join the Western Passenger Association, has notified Chairman Caldwell that it will not do so, stating that it is advised by counsel that the agreement is illegal.

Eastbound shipments from Chicago and Chicago Junctions to points at and beyond the Western termini of the trunk lines for the week ending June 17 amounted to 55,994 tons, as compared with 59,216 tons the preceding week. This statement includes 17,950 tons of grain, 3,494 tons of flour and 12,100 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	WEEK ENDING JUNE 17.		WEEK ENDING JUNE 10.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	4,807	8.6	4,579	7.7
C., C., C. & St. Louis	2,608	4.7	2,871	4 9
Erie	7,584	13.6	7,616	12.9
Grand Trunk	7,285	13.	6,343	10.7
L. S. & M. S	4,108	7 3	5,000	8.4
Michigan Central	5,889	10.5	6,634	11 2
N. Y., Chi. & St. L	4,827	8.6	6,604	11.2
Pitts., Cin., Chi. & St. Louis	5,650	10.1	5,797	9.8
Pitts., Ft. Wayne & Chicago	8,918	15.9	8,140	13.7
Wabash	4,318	7.7	5,632	9.5
Totals	55,994	100.0	59,216	100 0

Lake shipments last week were 78,389 tons.